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WASHINGTON'S SECOND INAUGURATION—1793

WINSTON'S
CUMULATIVE LOOSE-LEAF
ENCYCLOPEDIA
A COMPREHENSIVE REFERENCE WORK

EDITOR-IN-CHIEF
THOMAS E. FINEGAN, M.A., PD.D., LITT.D., LL.D.
Superintendent of Public Instruction
Commonwealth of Pennsylvania

In Ten Volumes

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KEY TO PRONUNCIATION

Three methods are used to indicate the pronunciation of the words forming the headings of the separate articles:

(1) By dividing the word into syllables, and indicating the syllable or syllables to be accented. This method is followed where the pronunciation is entirely obvious. Where accent marks are omitted, the omission indicates that all syllables are given substantially the same value.

(2) Where the pronunciation differs from the spelling, the word is re-spelled phonetically, in addition to the accentuation.

(3) Where the sound values of the vowels are not sufficiently indicated merely by an attempt at phonetic spelling, the following system of diacritical marks is additionally employed to approximate the proper sounds as closely as may be done:

ā, as in *fa*te, or in b*a*re.
ä, as in *a*lms, Fr. â*m*e, Ger. Ba*h*n=â of Indian names.
å, the same sound short or medium, as in Fr. b*a*l, Ger. M*a*nn.
a, as in f*a*t.
ą, as in f*a*ll.
a, obscure, as in r*u*r*a*l, similar to *u* in b*u*t, ė in h*e*r: common in Indian names.
ē, as in m*e*=*i* in mach*i*ne.
e, as in m*e*t.
ė, as in h*e*r.
ī, as in p*i*ne, or as *ei* in Ger. M*ei*n.
i, as in p*i*n, also used for the short sound corresponding to ē, as in French and Italian words.
eu, a long sound as in Fr. je*û*ne, = Ger. long *ö*, as in Söhne, Göthe (Goethe).
eu, corresponding sound short or medium, as in Fr. p*eu*=Ger. *ö* short.
ō, as in n*o*te, m*oa*n.
o, as in n*o*t, fr*o*g—that is, short or medium.
ö, as in m*o*ve, tw*o*.
ū, as in t*u*be.
u, as in t*u*b: similar to ė and also to *a*.
ų, as in b*u*ll.
ü, as in Sc ab*u*ne=Fr. *û* as in d*û*, Ger. *ü* long as in gr*ü*n, B*ü*hne.
ů, the corresponding short or medium sound, as in Fr. b*u*t, Ger. M*ü*ller.
oi, as in *oi*l.
ou, as in p*ou*nd; or as *au* in Ger. H*au*s.

The consonants, b, d, f, h, j, k, l, m, n, ng, p, sh, t, v, and z, when printed in Roman type, are always given their common English values in the transliteration of foreign words. The letter c is indicated by s or k, as the case may be. For the remaining consonant sounds the following symbols are employed:

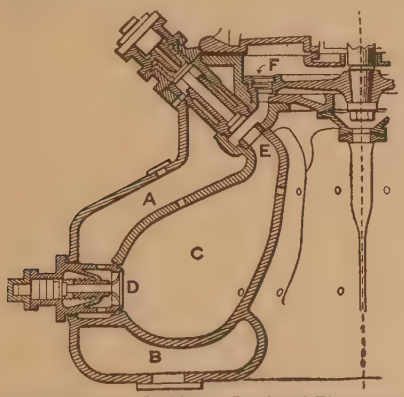
ch is always as in ri*ch*.
d, nearly as *th* in *th*is = Sp. *d* in Ma*d*ri*d*, etc.
g is always hard, as in *g*o.
h represents the guttural in Scotch lo*ch*, Ger. na*ch*, also other similar gutturals.
ŋ, Fr. nasal *n* as in bo*n*.
r represents both English *r*, and *r* in foreign words, in which it is generally much more strongly trilled.
s, always as in *s*o.
th, as *th* in *th*in.
th, as *th* in *th*is.
w always consonantal, as in *w*e.
x = ks, which are used instead.
y always consonantal, as in *y*ea (Fr. *ligne* would be re-written lēny).
zh, as *s* in pleasure = Fr. *j*.

WINSTON'S CUMULATIVE LOOSE-LEAF ENCYCLOPEDIA

VOLUME V

Gastrula (gas-trö'la), or GASTRÆA, the name given by Haeckel to the hypothetical larva which he assumed to be the starting point for the Metazoa or multicellular animals. The gastrula arises from a blastosphere or globular mass of cells which begin to fold in at one point until a thimble-shaped organism is formed. This individual he called a gastrula. It consists of two primitive layers, an outer layer, ectoderm, and an inner, endoderm. Consult Haeckel's *Studies on the Gastræa Theory* and his work on the calcareous sponges.

Gas Turbine, a turbine engine operating by the energy of exploded gases, first invented by Réné Armengaud in France, in 1906. Gas turbines are now of two types, the constant pressure and the explosion. The Armengaud engine is of the former type. The gas and air are compressed separately and the mixture admitted in a constant stream into a combustion chamber, where it is ignited by an incandescent platinum wire.



Holzwarth Gas Turbine.—Sectional Elevation.

A, compressed air chamber. B, compressed gas chamber. C, combustion chamber. D, valve admitting compressed air to combustion chamber. E, nozzle valve admitting exploding gas to rim of motor F.

The largest engine of this type ever produced was only 300 horsepower, and the death of the inventor left it unperfected.

Of the explosion type the Holzwarth turbine is the most efficient. In this the combustion chamber is intermittently filled with a mixture of gas and air admitted at the base of the machine. Ignition, explosion and increase in pressure of the burnt gases and their expansion through a nozzle result, after which the gases act on a horizontal turbine wheel. There are five or ten similar explosion chambers arranged in a circle at the base of the turbine, and these act one after the other or in series. When the combustion chamber has been filled with compressed air, compressed gas is driven in, while the nozzle valve remains closed. When the gas is ignited the valve is forced open and the pressure of the gases is transformed into kinetic energy. After each explosion the chamber is cleared and cooled by fresh air.

The turbine is provided with a horizontal governor shaft driven by a screw gearing. To this shaft are keyed the main governor, the emergency governor for preventing ignition, a tachometer, the ignition mechanism and the gear for operating a vertical oil distributor.

Gates (gāts), HORATIO, an American soldier, born in England in 1728. At the capture of Martinique he was aide-de-camp to General Monkton, and he was with Braddock when the latter was defeated in 1755. On the conclusion of peace he purchased an estate in Virginia, on which he resided until the Revolutionary war in 1775. He was at the head of the American army of the north when the British general Burgoyne was forced to surrender his whole army at Saratoga (1777), though most of the credit for this victory belonged to the preceding commander, General Schuyler. In 1780, after the capture of General Lincoln by Clinton, at Charleston, Gates received the chief command of the southern districts, but was badly defeated two months later by Cornwallis at Camden. He was then superseded by General Greene and brought to court-

martial, but was finally acquitted, and reinstated in his command in 1782 after the capture of Cornwallis. He then retired to Virginia, and in 1790, having emancipated all his slaves, he removed to New York, where he died in 1806.

Gates, MERRILL EDWARDS, educator, born at Warsaw, New York, in 1848. He was principal of the Albany Academy, 1870-82, president of Rutgers College, 1882-90, and of Amherst College, 1890-99, and a Congregational minister after 1899. He wrote *International Arbitration, Highest Use of Wealth; Sidney Lanier, Poet and Artist*, etc.

Gateshead, a parliamentary and municipal borough of England, County Durham, on the right bank of the Tyne, opposite Newcastle, of which it is practically part, being connected with it by three bridges. The industrial establishments include works where heavy articles in iron, such as girders, anchors, and chain cables, as well as engines, etc., are made; shipbuilding yards, roperies, brass, copper, and iron foundries, paper, glue, vinegar, glass, artificial manure, and large chemical works. In the vicinity are quarries from which the celebrated 'Newcastle grindstones' are obtained, and numerous collieries. Pop. (1911) 116,928.

Gath (Hebrew, 'wine-press'), one of the five royal cities of the Philistines, which, from its situation on the borders of Judah, was of much importance in the wars of the Jews and Philistines. It was the native town of Goliath, and was successively captured by David, Hazael, and Uzziah, who dismantled it. The site cannot be determined with certainty, but it is sometimes identified with Tell-es-Sâfieh, between Ekron and Ashdod.

Gatineau (gat-i-nō'), a river of Canada, Quebec province, the largest affluent of the Ottawa, rising in some lakes, and flowing almost due south to enter the Ottawa nearly opposite Ottawa city. It is not navigable more than five miles above the Ottawa except by canoes, but its rapid waters are well stocked with fish, and available as waterpower. The country through which it flows is, however, only partially settled.

Gatling (gat'ling), RICHARD JORDAN, inventor, born in Hertford County, North Carolina, in 1818; died in 1903. He studied medicine, but never practiced, removing eventually to Hartford, Connecticut, where he invented several ingenious machines, the most important being the machine gun which bears his name.

Gatling-gun. See *Machine-gun.*

Gatshina, GATCHINA (gat-chi'na), a town of Russia, government of, and 35 miles S. S. W. of St. Petersburg, on a small lake. It is regularly built, and contains one of the finest of the imperial palaces of Russia. Pop. 14,735.

Gau (gou), a German word of doubtful origin, meaning in general district, but in a special sense a district as a political unit, and its inhabitants as a political association. It formed a sort of middle division between the highest unit, the state, and the lowest, the village, corresponding in some respects to the 'hundred.' The freemen of the Gau met at certain periods, under an elected head, to settle matters relating to the public weal; and in the same way the head men of the Gauen met to settle matters relating to the state at large. In the Frankish Empire the character of the Gau was altered, each Gau now having as its head one or more royal officers called grafs or counts. These countships became hereditary, and about the twelfth century the Gau ceased to exist as a political division, though the name has survived in Aargau, Thurgau, etc.

Gauchos (gä-ō'chōs), natives of the pampas of the La Plata countries in South America, of Spanish descent. The race is noted for their spirit of wild independence, for horsemanship, and the use of the lasso. Their mode of life is rude and uncivilized, and they depend for subsistence chiefly on cattle-rearing.

Gauge, GAGE (gāj), STEAM AND WATER, the instruments fixed to engine boilers for registering the force of steam and the level of the water. The first often consists of a siphon tube, with equal legs, half-filled with mercury. One end is fastened into a pipe, which enters that part of the boiler which contains the steam; the other end is open to the atmosphere. The steam, acting on the mercury in one leg of the gauge, presses it down, and the mercury in the other leg rises, the difference between the two columns being the height of mercury which corresponds to the excess of the pressure of the steam in the boiler above the pressure of the atmosphere; or, in other words, to the effective pressure on the safety-valve. For high-pressure engines the steam-gauge usually consists of a spiral tube into which the steam is admitted, and which becomes less bent the greater the pressure. The water-gauge is a vertical glass tube, or flat

case, communicating above and below with the boiler. Gauge-cocks are sometimes put instead of or in addition to the tubes, for enabling the engineer to verify the level of the water.

Gauge, a standard of measurement. As applied to railways, gauge signifies the distance between the centers of each pair of rails, which in the ordinary gauge used in the United States is 4 feet 8½ inches. The broad gauge, as in the Great Western Railway of England, is 7 feet; the Irish, Indian, and Spanish gauge is 5 feet 6 inches. Special narrow gauges have recently been adopted for mountain and mineral lines, such as the 3 feet 6 inch gauge of the Norwegian lines. Gauge is also the name applied to various contrivances for measuring any special dimension, such as the wire gauge, an oblong plate of steel, with notches of different widths cut on the edge and numbered, the size of the wire being determined by trying it in the different notches until one is found which it exactly fits. The thickness of sheet-metal is tried by a similar gauge.

Gaul (gâl), GALLIA, in ancient geography, the country of the Gauls, the chief branch of the original stock of Celts. It extended at one time from the Pyrenees to the Rhine, and included also a part of Italy. Hence it was divided into Gaul on this side (the Roman side) of the Alps, or Gallia Cisalpina, and Gaul beyond the Alps, or Gallia Transalpina. Later the former was regarded quite as part of Italy, and the name Gallia was restricted to Transalpine Gaul, or the country nearly corresponding to modern France. Julius Cæsar, about the middle of the first century B.C., found Transalpine Gaul divided into three parts: 1. Aquitania, extending from the Pyrenees to the Garonne, chiefly occupied by Iberian tribes; 2. Gallia Celtica, Celtic Gaul, from the Garonne to the Seine and Marne; 3. Gallia Belgica, Belgic Gaul, in the north, extending to the Rhine.

Migrations among the Gauls about 397 B.C., and their passage of the Alps, first bring the Gallic nation into the region of history. Having crossed the Alps they fell upon the Etruscans, defeated the Romans at Allia (390 B.C.), and sacked and burned Rome, the capitol, however, being saved by Camillus. More than a century after the burning of Rome, the eastern Gauls, in 280-278 B.C., made three destructive irruptions into Macedonia and Greece. Several tribes pursued their course into Asia Minor, where, under the name of *Galatians*, they long retained their national peculiarities. After these migrations the Gauls along the banks of the Danube, and in the south of Germany disappeared. Tribes of German origin occupied the whole country as far as the Rhine, and even beyond that river. The Belgæ, who were partly German, occupied the northern part of Gaul, from the Seine and Marne to the British Channel and the Rhine, from whence colonists passed over into Britain, and settled on the coast districts. The Celts in Gaul had attained some degree of cultivation by intercourse with the Greeks and Carthaginians before they came in contact with the Romans. Those of Cisalpine Gaul continued formidable to Rome until after the First Punic war, when the nation was compelled, as the result of a war of six years, to submit to the Romans (220 B.C.). When Hannibal marched on Rome they attempted to shake off the yoke; but the Romans, victorious over the Carthaginians, reduced them again to submission. Thirty-one years later (189 B.C.) their kindred tribe in Asia, the Galatians, met with the same fate; they also were vanquished, and their princes (tetrarchs) became tributary. In the years 128-122 B.C. the Romans conquered the southern part of Gaul along the sea from the Alps to the Pyrenees, and here established their dominion in what was called the Province (Provincia), a name that still exists as Provence. Not long after Gaulish tribes shared in the destructive incursions of the Cimbri and Teutones on the Roman territory, which were ended by Marius in the battles of Aquæ Sextiæ (Aix) in 102, and Vercelli in 101 B.C. On the appointment of Julius Cæsar to the proconsulship over the countries bordering on Gaul, he resolved to subject all Gaul, and executed his purpose in less than nine years (58-50 B.C.), in eight bloody campaigns. The dominion of the Romans in Gaul was confined by colonies, and the liberal grant of the Roman citizenship to several Gallic tribes. The religion of the Druids, being suppressed in Gaul by Tiberius and Claudius, gradually retreated into Britain, soon also conquered by the Romans. After the extinction of the Cæsars, the Gauls once more attempted to recover their liberty by aid of the Germans, but after this last effort became entirely Romanized, even their ancient language, the Celtic, being supplanted by a corrupt Latin dialect. About the year 486 the Franks subdued the greater part of Gaul, and put a period to the dominion of the Romans in that country. See *France*.

Gault (gâlt), in geology, a series of stiff marls or calcareous clays.

varying in color from a light gray to a dark blue, occurring between the Upper and Lower Greensands of the Chalk formation of England. It is developed chiefly in the neighborhood of Folkestone (hence called *Folkestone marl*), and in Cambridgeshire.

Gaultheria (gạl-thē'ri-ä), a genus of American shrubs belonging to the order Ericaceæ. It is widely distributed in North America. *G. procumbeus*, the well-known wintergreen plant, is a creeper bearing white flowers, and in the fall edible red berries.

Gauntlet, or GANTLET (gạnt'let, gant'let), a glove made originally of chain-mail, later of plate and jointed at the fingers, used as part of the armor of a warrior in former times.

Gaur, or GOUR (gour), a ruined city in Hindustan, 60 miles north by west of Murshedabad. Once the capital of Bengal, extending about 7 miles along the old Ganges. Several villages now stand on the site of the city.

Gaur, GOUR, one of the largest of all the ox tribe (*Bos gaurus* or *Bibos gaurus*), inhabitating the mountain jungles of India, remarkable for the extraordinary elevation of its spinal ridge, the absence of a dewlap, and its white 'stockings,' which reach above the knee. It is so fierce when roused that neither tiger, rhinoceros, nor elephant dare attack it. The hide on the shoulders and hindquarters is sometimes nearly 2 inches in thickness even after being dried, and is therefore much valued for the purpose of being manufactured into shields. The animal is supposed to be incapable of domestication.

Gauss (gous), KARL FRIEDRICH, a German mathematician, born 1777. In 1801 he published his *Disquisitiones Arithmeticæ*, treating of indeterminate analysis or transcendental arithmetic, and containing, in addition to many new theorems, a demonstration of the theorem of Fermat concerning triangular numbers. He also calculated, by a new method, the orbit of the planets Ceres and Pallas. In 1807 he became professor of mathematics and director of the observatory at Göttingen, a position which he held till his death in 1855. He was pronounced by Laplace to be the greatest mathematician in Europe. His chief works were the *Theorio Motus Corporum Cœlestium* (1809), *Intensitas Vis Magneticæ Terrestris* (1833), *Dioptrische Untersuchungen* (1841), and *Untersuchungen über Gegenstände der höheren Geodesie* (1844).

Gaut. See *Ghâts.*

Gautama (gạ'ta-ma), a name of Buddha, the founder of Buddhism. See *Buddha.*

Gautier (gō-ti-ā), THÉOPHILE, a French poet and critic, born in 1811 at Tarbes (Hautes-Pyrénées). He studied painting under Rioult for two years, but gave up the brush for the pen, threw himself vigorously into the Romanticist movement, published a volume of poems in 1830, and for several years worked at general literary criticism. In 1832 appeared his poem *Albertus;* but his first great success was the romance *Mademoiselle de Maupin*, which led to his engagement by Balzac as secretary. He was afterwards engaged as theatrical and art critic on the *Revue de Paris*, the *Artiste*, *the Moniteur*, and the *Journal Officiel.* Owing to his connection with the *Journal Officiel* his fortunes became linked in some measure with those of the Bonaparte family, and he was appointed librarian to the Princess Mathilde. In 1872 he was sent by the republican government on a literary mission to Italy, and died in the same year. Among the most interesting of his productions may be ranked his *Voyages en Espagne* (1843), his *Italia* (1852), *Caprices et Zigzags* (1845), and *Constantinople* (1854), narratives of his travels; his *Roman de la Momie* (1856), *Le Capitaine Fracasse* (1863), *Belle Jenny* (1865), *Spirite* (1866), novels, together with the brilliant short stories, *Fortunio*, *Une Nuit de Cléopâtre*, *Jean et Jeanette*, *Le Roi Candaule*, etc.; and his *Histoire de l'Art Dramatique en France depuis Vingt-cinq Ans* (1849), *Les Beaux Arts en Europe* (1852), etc.

Gauze (gạz), a thin transparent stuff of silk, linen, or cotton. It is either plain or figured, the latter being sometimes worked with flowers of silver or gold.

Gavarni (gȧ-vȧr'nē), the assumed name of SULPICE PAUL CHEVALIER, a French caricaturist, born at Paris in 1801. Originally a mechanical draughtsman, he began his artistic career in 1835 by designing costumes for theaters and journals of fashion. He then established *Les Gens du Monde;* but the journal was a failure, and the artist spent some time in the debtor's prison of Clichy. On his release he was employed upon the *Charivari*, the success of which was due in great part to his genius. His best known works are *Les Enfants Terribles*, *Les Rêves*, *Les Fourberies de Femmes*, and *Impressions de Ménages.* In 1847 he visited England, and the sketches which he sent from St

Giles, London, to *L'Illustration* created an immense sensation. He afterwards illustrated Eugene Sue's *Wandering Jew*, Balzac's novels, and other works. He died in 1866.

Gavazzi (gȧ-vȧt'sē), ALESSANDRO, a popular Italian preacher and political agitator, born at Bologna 1809; died at Rome 1889. At the age of fifteen he became a monk of the Barnabite order, at twenty he was professor of rhetoric in the College of Naples, and soon after made his mark as a pulpit orator. In 1846 he was chaplain general of the Roman patriotic league. Subsequently he threw off his papal allegiance and joined the agitation which ended in the short-lived republic. The French occupation of Rome drove him into exile, when he traveled through Britain and America lecturing against the Church of Rome, his power as an orator evoking much enthusiasm. He was with Garibaldi in 1860, and made subsequent visits to Britain gathering funds for the Free Italian Church, in the interests of which he lectured, preached, and traveled on deputation work till a short time before his death.

Gavelkind (gā'vel-kīnd), an old English tenure, by which the land of the father was at his death equally divided among his sons, or in default of sons, among the daughters. The issue of a deceased son inherited the father's part. Collaterally, also, when one brother died without issue all the other brothers inherited from him. Gavelkind, before the Norman conquest, was the general custom of the realm; it was then superseded by the feudal law of primogeniture, and only retained in Wales and Kent. The custom continued in Wales till the time of Henry VIII; in Kent all land is still held in gavelkind unless specially disgaveled by act of Parliament.

Gavial (gā'vi-al; *Gaviālis Gangeticus*), the Indian crocodile, characterized by the narrow, almost cylindrical jaws which form an exceedingly elongated muzzle. The teeth (about 120 in number) are of equal length, and the feet are completely webbed. The males can be distinguished from the females by the shape of the muzzle, which is much smaller at the extremity. The only extant species occurs in South and Eastern Asia, especially in the Ganges. It feeds on fishes and small prey.

Head of Gavial or Gangetic Crocodile (*Gavialis Gangeticus*).

Gavotte (ga-vot'), an air for a dance with two strains, each of four or eight bars, in $\frac{2}{4}$ or $\frac{4}{4}$ time, the starting notes occupying half a bar. Like the minuet, it has been introduced for free treatment into suites, sonatas, etc. The name is said to be derived from the Gavots, the inhabitants of the Gap, in France.

Gay (gā), JOHN, an English poet, born near Barnstaple in 1688, and apprenticed to a silk mercer in London. In 1711 he published his *Rural Sports*, which he dedicated to Pope, with whom he formed a close friendship. In 1712 he became secretary to Anne, Duchess of Monmouth, and his mock-heroic poem, *Trivia, or the Art of Walking the Streets of London*, appeared in the same year. In 1714 his caricature of Ambrose Philips' pastoral poetry was published, under the title of the *Shepherd's Week*, and dedicated to Lord Bolingbroke, by whose interest he was appointed secretary to the Earl of Clarendon, in his embassy to the court of Hanover. In 1715 appeared his burlesque drama of *What d'ye Call It?* but his next piece, the farce, *Three Hours After Marriage*, altogether failed. In 1720 he published his poems by subscription, in 1723 his tragedy, *The Captives*, and in 1726 his well-known *Fables*. His *Beggar's Opera*, the notion of which seems to have been afforded by Swift, was first acted in 1727, at Lincoln's Inn Fields, where it ran for sixty-three nights, but the lord chamberlain refused to license for performance a second part entitled *Polly*. The latter part of his life was spent in the house of the Duke of Queensberry, where he wrote his sonata *Acis and Galatea* and the opera *Achilles*. He died in 1732.

Gay, MARIE-FRANÇOISE-SOPHIE, a French authoress, born at Paris in 1776; maiden name, Nichault de Lavalette. She was first married to a financier, M. Liottier, from whom after six years she was divorced to marry M. Gay, a receiver general under the empire. Her salon was a famous resort for the men of letters and artists of the time. She died at Paris in 1852. Her chief works are *Laure d'Estell* (1802), *Anatole* (1815), *Le Moqueur Amoureuse* (1830), *Scènes de Jeunes Ages* (1833), *La*

Duchesse de Châteauroux (1834), *Les Salons Célèbres* (1837), and *Le Mari Confident* (1849). For her daughter, DELPHINE GAY, see *Girardin (Madame de)*.

Gaya (gī'â), the chief town of a district of the same name in Bengal, on the right bank of the Phalgu, a tributary of the Ganges, 260 miles N. W. of Calcutta. It consists of an old and a new town. The former occupies a rocky height, is inhabited chiefly by Brahmans, and being regarded as a place of great sanctity, is annually visited by vast crowds of pilgrims. The latter, called Sahibganj, is the trading quarter, and the seat of administration where the European residents dwell. The place abounds with objects of Hindu worship, and almost every height in the vicinity is the subject of a legend. Pop. 71,288. The district has an area of 4712 square miles.

Gayal, GYAL (gī'al), a species of ox (*Bos frontālis*) found wild in the mountains of Northern Burmah and Assam, and long domesticated in these countries and in the eastern parts of Bengal. The head is very broad and flat in the upper part, and contracts suddenly towards the nose; the horns are short and slightly curved. The animal has no proper hump, but on the shoulders and forepart of the back there is a sharp ridge. The color is chiefly a dark brown. Its milk is exceedingly rich, though not abundant.

Gayarre (gī-à-rā'), CHARLES ARTHUR, historian, born in Louisiana in 1805; died in 1895. He was secretary of state of Louisiana 1846-53, and presiding judge of the city of New Orleans. He wrote *History of Louisiana* and *Louisiana: Its History as a French Colony.*

Gay-Lussac (gā-lûs-âk), LOUIS JOSEPH, a French chemist and physicist, born at St. Léonard (Haute-Vienne) in 1778; died at Paris in 1850. He was educated in the Ecole Polytechnique from 1797 to 1800, and afterwards in the Ecole des Ponts et Chaussées, but preferring chemistry, he entered Berthollet's Ecole Laboratoire. In 1802 he returned to the Polytechnique as demonstrator of chemistry, and in 1804 performed his two balloon ascents for scientific purposes, the first with Biot, the second by himself, an account of which appeared in the *Journal de Physique.* In 1806 he was elected to the Academy of Sciences. In 1808 he was appointed professor of physics at the Sorbonne, a post he held for twenty-four years, in 1809 professor of chemistry in the Ecole Polytechnique, and then succeeded Fourcroy as professor of general chemistry in the Jardin des Plantes. In 1831 he entered the chamber of deputies, and in 1839 he was made a peer of France, but he never took an active part in politics. He was especially celebrated for his researches into the chemical and physical properties of gases and vapors. For many years he edited, in conjunction with Arago, the *Annales de Chimie et de Physique;* and many of his numerous memoirs were published in this or in the *Comptes Rendus.* He also published, along with Thénard, *Recherches Physico-chimiques,* in which some of their most important discoveries are described. Other works are his *Cours de Physique* and *Leçons de Chimie.*

Gaynor (gā'nor), WILLIAM J., jurist, born at Whitestown, New York, in 1851. He went to Brooklyn in 1873 and worked on Brooklyn and New York newspapers while studying law. Was admitted to the bar in 1875, and took part in many important cases, becoming known nationally for his work in breaking up rings in the Democratic party and in securing the conviction of John Y. Kane for election frauds. He was elected judge of the Supreme Court of New York in 1893 and again in 1907, for twelve years, declined a nomination for mayor of Brooklyn in 1897, also for governor of New York and for judge of the Court of Appeals, and in 1909 was elected Democratic mayor of New York. As such he gave eminent satisfaction by his earnest efforts to improve conditions in that city. In the nominating convention for governor in 1910 he declined to let his name be used. He was shot by a disappointed office-seeker in the summer of 1910, receiving a serious but not a fatal wound. He died September 11, 1913.

Gaza (gā'za), an ancient town of Syria, originally a city of the Philistines, near the Mediterranean, 50 miles S. S. W. of Jerusalem. The modern town, Ghuzzeh, is a principal entrepôt for the caravans passing between Egypt and Syria. The population has increased rapidly of recent years and is now estimated at 16,000.

Gaza (gā'zà), THEODORE, a Renaissance scholar, born at Thessalonica about 1405; died in Calabria in 1478. He came to Italy about 1430; became teacher of Greek at Ferrara; was patronized by Pope Nicholas V, Cardinal Bessarion, and King Alfonso of Naples. Gaza labored for the diffusion of Greek literature, not only by teaching, but also by his writings, and especially by Latin translations of the Greek clas-

sics. His chief work is a translation of the writings of Aristotle on natural history.

Gazelle (ga-zel'; *Gazella dorcas*), the type of a sub-family of antelopes (Gazelinæ), which includes some 23 species of small, mostly desert-loving forms. Its color is a light fawn upon the back, deepening into dark-brown in a wide band which edges the flanks and forms a line of demarcation between the color of the upper portions of the body and the pure white of the abdomen. The eye of the gazelle is large, soft, and lustrous. Both sexes are provided with horns, round, black, and lyrated, about 13 inches long. It seems to be confined to the north side of the Atlas Mountains, Egypt, Abyssinia, Syria, Arabia, and South Persia.

Gazelles (*Gazella dorcas*)

Gazette (ga-zet'; from *gazzetta*, a small Venetian coin, which was the price of the first newspaper), a newspaper, especially an official newspaper. The first gazette in England was published at Oxford in 1655. On the removal of the court to London the title of *London Gazette* was adopted. It is now the official newspaper, and published on Tuesdays and Fridays. It is the organ by means of which all state intelligence, proclamations, appointments, etc., are promulgated, and in which declarations of insolvency are published. A similar official newspaper is published also in Edinburgh and Dublin.

Gazetteer (gaz-e-tēr'), a geographical dictionary; a book containing descriptions of natural and political divisions, countries, cities, towns, rivers, mountains, etc., alphabetically arranged. Among the more important general works of this kind are McCulloch's *Geographical Dictionary*, Johnstone's *Dictionary of Geography*, Blackie's *Imperial Gazetteer*, Lippincott's *Pronouncing Gazetteer* (based upon Blackie's), Saint Martin's *Nouveau Dictionnaire de Géographie Universelle*, and Ritter's *Geographisch-Statistisches Lexikon*. There are also various gazetteers confined to particular countries.

Gazogene (gaz'u-jēn), an apparatus used for manufacturing aerated water on a small scale for domestic use, by the combination of an alkali and an acid, as carbonate of soda and tartaric acid, which yield carbonic acid when mixed with water. It generally consists of two globes, one above the other, connected by a tube, the lower for containing water, and the upper the ingredients for producing the gas. The vessel is made air-tight by means of a screw-top, and when water is gently introduced into the upper globe from the lower, by inclining the vessel so as to fill about a half of the former, chemical action takes place, and the carbonic acid evolved gradually saturates the water in the lower globe. When this has taken place, the aerated water can be drawn off by opening a stopcock at the top attached to a second tube which reaches almost to the bottom of the lower globe.

Gean (gēn), a kind of wild cherry-tree (*Prunus Avium*), common in Britain. The fruit is smaller than that of the common cherry, of a red color when unripe, and a deep purple or black when it arrives at maturity. The flavor is superior to that of most cherries. The wood is used for furniture and other purposes.

Gearing (gēr'ing), in machinery, the parts collectively by which motion communicated to one portion of a machine is transmitted to another, generally a train of toothed wheels. There are two chief sorts of wheel gearing, viz. *spur-gearing* and *beveled gearing*. In the former the teeth are arranged round either the concave or convex surface of a cylindrical wheel in the direction of radii from the center of the wheel, and are of equal depth throughout. In *beveled gearing* the teeth are placed upon a beveled surface round a wheel which if the slope of the bevel were continued would form a cone.

Geary (gē're), JOHN WHITE, born in Westmoreland County, Pennsylvania, in 1819; died in 1873. He became an engineer officer in the Mexican war, and then the first United States postmaster of San Francisco. Returning to the East in 1856, he became governor of Kansas Territory and restored order there, but resigned in 1857. During the Civil war he served with distinction and became a brigadier general, and at the close major general. In 1866 he was elected governor of Pennsylvania and re-elected in 1869.

Gebang Palm (gē-bang'), the *Corypha gebanga*, a fan-leaved palm of S. E. Asia.

Geber (gē'bėr), an Arabian chemist or alchemist, often designated the father of chemistry, who flourished during the eighth century. He was

acquainted with nearly all the chemical processes in use down to the eighteenth century. His writings describe various kinds of furnaces and other apparatus, and cupellation, distillation, and other chemical processes; the purification, composition, and properties of the metals then known—gold, silver, copper, lead, tin, and iron, and the functions of mercury, sulphur, and arsenic. He is the reputed author of an immense number of works, as well on metaphysics, language, astronomy, etc., as on chemistry.

Gecko (gek'ō), a name common to the members of a family of nocturnal lizards (*Geckotidæ*), characterized by the general flatness of their form, especially of the head, which is somewhat of a triangular shape; the body is covered on the upper part with numerous round prominences or warts; the feet are rather short, and the toes of nearly equal length and furnished with flattened sucking pads by means of which the animals can run up a perpendicular wall, or even across a ceiling. The greatest number feed on insects and their larvæ and pupæ. Several of the species infest houses, where, although they are perfectly innocuous, their appearance makes them unwelcome tenants. One species is common in N. Africa and S. Europe.

Ged (ged), WILLIAM, the inventor of stereotyping, born in Edinburgh about the beginning of the eighteenth century; died in poor circumstances in 1749. He first practiced his great improvement in the art of printing in 1725; and some years later he entered into a partnership in London, the result of which was the production of two prayer-books only. He returned to Scotland in 1733, and published a stereotype edition of Sallust.

Geddes (ged'es), ALEXANDER, a Roman Catholic divine, poet, and miscellaneous writer, was born in Banff, Scotland, in 1737; died in London 1802.

Geddes, SIR AUCKLAND CAMPBELL, a British anatomist, soldier, administrator, cabinet minister, educator and diplomat, born in 1879, son of Auckland Campbell Geddes of Edinburgh. He served in the South African war and the European war; was director of recruiting, minister of national service, president of the local government board, and in 1919 minister of reconstruction. He was professor of anatomy in Edinburgh, Dublin, and McGill University (Canada). He was appointed principal of McGill University, but rescinded his acceptance on being offered the post of ambassador to the United States in 1920.—SIR ERIC, brother of former, British railroad expert, member of the Imperial War Cabinet, inspector-general of transportation, and First Lord of the Admiralty, born in India in 1876.

Geddes, JENNY, the name tradition gives to a street fruit-seller who, during the tumult in St. Giles' Church, Edinburgh, in July, 1637, when the dean attempted to introduce the Episcopalian service-book, threw her stool at his head exclaiming, 'Villain! dost thou say mass at my lug?' This tumult led to events which annulled Episcopacy and restored Presbyterianism. The honor of the exploit has been claimed for a Barbara Hamilton, wife of John Mein, merchant in Edinburgh, but Jenny Geddes, the street fruit-seller's claim, has always been the popular one, and recently a memorial brass was placed in St. Giles to her memory.

Geefs (gāfs), GUILLAUME, a Belgian sculptor, born at Antwerp 1806, died 1883. Among his most important works are the monument to the Victims of the Revolution of 1830 at Brussels; a statue of Rubens in front of Antwerp Cathedral; statues of King Leopold, etc. His brothers JOSEPH (died 1860) and ALOYS (died 1841) were also sculptors of reputation.

Geel (gāl). See *Gheel.*

Geelong (gē-long'), an Australian seaport town, colony of Victoria, near the head of the west arm of Port Philip Bay, 45 miles southwest of Melbourne. The town is well laid out, and there is an extensive botanical garden and several public parks. There are three jetties in the bay, alongside of which ships of the largest tonnage can load and discharge. There are wool mills, tanneries, ropeworks, etc., and a considerable trade is done in wool. Pop., inclusive of suburbs, 23,311.

Geestemünde (gās'tē-mün-dē), a seaport town of North Prussia, in Hanover, at the mouth of the Weser, separated from Bremerhaven by the Geeste. Extensive docks were constructed here in 1857-63. The port is strongy fortified, and the trade is increasing rapidly. The industries include shipbuilding, iron-founding, engineering, etc. Pop. 23,625. Geestendorf, formerly a separate town, has been united with it since 1889.

Geez (gēz), the name of an Ethiopian language. See *Ethiopia.*

Gefle (yef'le), a seaport of Sweden, near the mouth of a river of same name in the Gulf of Bothnia, 50 miles N. of Upsala. It stands on both

sides of the river and two islands formed by it, and has an excellent harbor. It has manufactures of linen, leather, tobacco, sail-cloth, etc.; shipbuilding yards; and an extensive trade in deals, tar, pitch, iron, etc. Pop. 29,522.

Gegenbaur (gā'gen-bour), anatomist, born at Würzburg, Germany, in 1826. He studied biology, became professor of anatomy at Jena in 1858 and at Heidelberg in 1873. He wrote several able works, chief among which is his *Outline of Comparative Anatomy*.

Gehenna (gē-hen'a), a term used in the New Testament as equivalent to a place of fire or torment, and rendered in the authorized (and the revised) version by *hell* and *hell-fire*. It is a form of the Hebrew *Ge-hinnom*, the valley of Hinnom, in which was Tophet, where the Israelites sometimes sacrificed their children to Moloch (II Kings, xxiii, 10). On this account the place was afterwards regarded as a place of abomination, and became the receptacle for the refuse of the city, perpetual fires being kept up in order to prevent pestilential effluvia.

Geibel (gī'bl), EMANUEL, a German poet, born at Lübeck in 1815; died 1884. He studied at the universities of Bonn and Berlin, and resided a year or two in Greece. He published in 1840 his first collection of poems, which reached its hundredth edition in 1884. In 1843 he published a tragedy, *King Roderick;* in 1846 the epic *König Sigurd's Brautfahrt*. A second collection of his poems appeared in 1848—*Juniuslieder* ('June Songs'). Other collections were issued later. He was honorary professor of æsthetics and poetry in the University of Munich 1851-69, but spent his later days in his native town. He wrote also *Brunhild*, a tragedy; *The Loreley*, an opera in rhyme; and several other plays, but his fame rests on his lyrics, which are immensely popular.

Geikie (gē'ki), SIR ARCHIBALD, geologist, born at Edinburgh in 1835. He was appointed to the geological survey in 1855; became director of the Scottish survey in 1867; was professor of geology and mineralogy in Edinburgh University 1870-81, and in 1881 became director general to the United Kingdom survey, and head of the Museum of Practical Geology, London. He is the author of numerous manuals, etc., on geology.

Geikie, JAMES (1839-1915), geologist, brother of Archibald Geikie, born at Edinburgh. Author of *The Great Ice Age, Outlines of Geology*, etc.

Geisha (gā'sha), in Japan a singing and dancing girl. Geisha girls begin their training as professional entertainers at a very early age and are a feature of Japanese social life.

Geissler's Tubes (gis'lêr), from the name of Heinrich Geissler, a philosophical instrument-maker of Bonn, who produced tubes made of very hard glass, and containing highly rarefied gases. Each end of the tube has a platinum wire sealed into it to serve as an electrode. When a discharge of electricity from an induction coil is caused to take place in these tubes, very brilliant effects may be produced.

Gela (jē'la), one of the most important ancient Greek cities of Sicily, situated on the south coast of the island between Agrigentum and Camarina; founded in 690 B.C. by a colony of Cretans and Rhodians. The colony was remarkably prosperous, and in 582 B.C. sent out a portion of its inhabitants, who founded Agrigentum. In 280 Phintias, the tyrant of Agrigentum, utterly destroyed Gela. Its site has been the subject of much controversy.

Gelada (gel'a-da), a singular Abyssinian baboon, remarkable for the heavy mane which hangs over the shoulders, and which only grows when the animal is adult. It is called *Gelada Ruppellii*, in honor of Dr. Ruppell, its discoverer.

Gelasius (je-la'si-us), the name of two popes—GELASIUS I and II. The former, who held the see from 492-496, founding on the alleged primacy of Peter, was one of the first who openly maintained that the Roman bishop alone was entitled to regulate matters of faith and discipline, though in practice he had not then attained any such superiority. GELASIUS II, pope for only one year (1118-19), and originally called John of Gaeta, was elected by the party hostile to Henry V, but was obliged to give way to Gregory VIII, supported by the emperor, and shortly after died in the monastery of Clugny.

Gelatine (jel'a-tin), a concrete animal substance, transparent, and soluble slowly in cold water, but rapidly in warm water. It is confined to the solid parts of the body, such as tendons, ligaments, cartilages, and bones, and exists nearly pure in the skin, but it is not contained in any healthy animal fluid. Its leading character is the formation of a tremulous jelly when its solution in boiling water cools. Gelatine does not exist as such in the animal tis-

sues, but is formed by the action of boiling water. The coarser forms of gelatine from hoofs, hides, etc., are called *glue;* that from skin and finer membranes is called *size;* and the purest gelatine, from the air-bladders and other membranes of fish, is called *isinglass.* With tannin a yellowish white precipitate is thrown down from a solution of gelatine, which forms an elastic adhesive mass, not unlike vegetable gluten, and is a compound of tannin and gelatine. It is this action of tannin on gelatine that is the foundation of the art of tanning leather. In relation to the arts the uses of gelatin have been greatly extended. It is the foundation of the dry-plate system of photography; it is used in the printing process employed by Goupil of Paris and others for making highly artistic copies of pictures; and it is extensively utilized by druggists for coating pills and nauseous drugs. In the form of isinglass it is employed by brewers for clarifying beer, and also for wine, by reason of its forming a coagulum when acted upon by the chemicals of those liquids and precipitating the extraneous matter held in solution.

Gelderland, GUELDERLAND (gel'derland), a province of the Netherlands; area, 1963 English sq. miles. It is generally flat, and has much alluvial soil, well fitted both for arable and grass husbandry. The manufactures, principally woolen, cotton, and linen goods, soap, salt, and glass, are carried on extensively in various quarters. The principal towns are Arnheim, Nijmegen, Thiel, and Zutphen. Pop. 566,549.

Geldern (gel'dĕrn), a town of Rhenish Prussia, 27 miles northwest of Düsseldorf. Pop. 6551.

Gelder-rose. See *Guelder-rose.*

Gelee (zhē-lā), CLAUDE. See *Claude Lorraine.*

Gell (jel), SIR WILLIAM, an English antiquarian and classical scholar, born in 1777; died at Naples in 1836. He was educated at Cambridge, and was for some time a fellow of Emanuel College in that university. In 1814 the Princess of Wales (afterwards Queen Caroline) appointed him one of her chamberlains, and he accompanied her on her travels for several years. His principal works are: *The Topography of Troy, The Geography and Antiquities of Ithaca, The Itinerary of Greece. The Itinerary of the Morea, The Topography of Rome,* and the interesting and beautiful work, *Pompeiana, or Observations Upon the Topography, Edifices, and Ornaments of Pompeii.*

Gellert (gel'ĕrt), CHRISTIAN FÜRCHTEGOTT, a German poet, born in 1715; died in 1769. He was appointed extraordinary professor of philosophy at Leipzig in 1751, where his lectures were received with great applause. His hymns, tales, fables, and essays enjoyed much popularity in their day.

Gellius (jel'lius), AULUS, a Roman author of the second century. His *Noctes Atticæ,* a book of selected passages from many ancient authors, is now of great value, as the authors from which he drew his materials are in a great measure lost.

Gelnhausen (geln'hou-zn), an old walled town of Prussia, province Hesse-Nassau, 16 miles E. N. E. of Hanau, on the Kinzig. Its principal buildings are a large Gothic church of the thirteenth century, and, on an island in the Kinzig, a recently-restored palace in which Frederick Barbarossa and several of his successors used to reside. Pop. 4500.

Gelon (jē'lon), an ancient Greek ruler, tyrant of Gela, and afterwards of Syracuse. After the death of Hippocrates, tyrant of Gela, he seized the sovereign power (B.C. 491), and about 485 B.C. gained possession of Syracuse. From this time he bent all his energies to the aggrandizement of his new capital, the power and importance of which he greatly increased by his conquests and good government. His aid was sought by the Greeks against Xerxes, but a formidable invasion of Carthaginians under Hamilcar engaged him in Sicily. The result was the total defeat of the Carthaginians in the great battle of Himera (B.C. 480). It is celebrated in an ode by Pindar. Gelon died in 478 B.C., and was succeeded by his brother Hieron.

Gelsemium (jel-se'mi-um), a genus of plants belonging to the nat. order Loganiaceæ, the best-known, *G. nitidum* or Carolina jasmine, being an evergreen climbing shrub of the Southern States, with twigs producing a milky juice, opposite lance-shaped shining leaves, and sweet-scented yellow flowers. The root has valuable medicinal properties, being used for controlling certain forms of nervous irritability.

Gemara (ge-mä'ra), in Jewish literature, the second part of the Talmud or commentary on the Mishna. See *Talmud.*

Gembloux (zän-blö), an old Belgian town, province of Namur, 24 miles S. E. of Brussels. It has a Benedictine abbey of the ninth cen-

tury, now used as a royal agricultural institution. Pop. 4643.

Gemini (jem'i-nī, the Twins (II), the third sign of the zodiac, so named from its two brightest stars, Castor, of the first magnitude, farthest to the west, and Pollux, of the second, farthest to the east. Its constituent stars form a binary system revolving in about 250 years. The sun is in Gemini from about May 21st till June 21st, or the longest day.

Gemmation (jem-mā'shun), in zoology, a mode of reproduction among certain animals of low type, which consists in the production of a bud or buds, generally from the exterior, but sometimes from the interior, of the body of the animal, which buds are developed into independent beings that may or may not remain attached to the parent organism. The fresh beings thus produced are known as zooids. Gemmation is also observed in plants of simple organization such as the yeast.

Gems (jems), or precious stones, are sometimes found crystallized in regular shapes and with a natural polish, more commonly of irregular shapes and with a rough coat. The term gem often denotes more particularly a stone that is cut, polished, or engraved, and it also includes pearls and various artificial productions. Precious stones in their natural state are usually encrusted with various deposits; and it is to remove this crust and to bring out the real beauty of the gem that the work of cutting and polishing is performed. The stones that are thus treated include the ruby, diamond, emerald, sapphire, garnet, topaz and amethyst. These are classed as transparent stones. The opal is semi-transparent. Among the more or less opaque stones are the turquoise, lapis lazuli, agate, onyx, cat's-eye, moonstone, bloodstone, jade and carnelian. Imitation gems are extensively manufactured. The base of one class of imitations is a peculiar kind of glass of considerable hardness, brilliancy and refractive power called *paste* or *strass*. When the strass is obtained very pure it is melted and mixed with substances having a metallic base, generally oxides, which communicate to the mass the most varied colors. Another class often fraudulently offered for sale as genuine stones are made by cementing thin plates of precious materials over and sometimes under a body of worthless glass. This veneered stone successfully undergoes the surface test, and by the uninitiated is often accepted as a valuable gem.

The art of manufacturing gems synthetically, that is, by the combination of chemical elements present in the real stone, has reached a high degree of success. The diamond, which is an allotropic form of carbon, has hitherto resisted attempts to reproduce it of sufficient size to have a commercial value. By dissolving carbon in molten iron and suddenly cooling the molten mass by a stream of water, whereupon the outer part contracts with great force and compresses the interior so that the carbon separates out, Moissan, the French chemist, succeeded in isolating small crystals, none, however, as large as 1/25 inch in diameter.

Experiments in the manufacture of the ruby have met with such success that the synthetic ruby is produced of a size and of a perfection that would place a prohibitive value on the natural stone. The ruby, chemically considered, is crystallized alumina, or oxide of aluminum, with a small percentage of oxide of chromium. Sapphire is of the same material, differing from the ruby only in color. The ruby owes its fine red color to the presence of oxide of chromium; the sapphire its deep blue to either a lower oxide of chromium or to an oxide of titanium. Crystallized alumina in the different colors receives different trade names, as Oriental emerald for the green; Oriental topaz for the yellow; Oriental amethyst for the purple; while the water-clear, colorless crystal is known as white sapphire. The process of manufacture of rubies is carried on with the oxyhydrogen blowpipe, to whose intense heat the powdered alumina with its coloring oxides is subjected. Rubies have been thus produced weighing 12 to 15 carats when cut. The average weight of the native Burmese ruby is about one-eighth of a carat. The sapphire and the so-called Oriental stones are prepared in the same manner, with the addition of proper coloring matter. The emerald and opal have not emerged from the experimental stage, although Becquerel, a French chemist, is reported to have produced opals from solutions of silicates with high-tension electric currents. To be distinguished from synthetic gems are reconstructed stones, which (as yet only done with the ruby) are pieces of the natural stone fused together. They are very brittle. The pearl is not produced synthetically, but many imitations exist. The Japanese produce them by fastening a piece of mother-of-pearl in the shells of the pearl-oyster and allowing it to remain there for a number of years. The turquoise, a phosphate of aluminum colored with copper, is not synthetically produced, although various experiments with its manufacture have been made.

Gemsbok (jemz'bok), the *Oryx gazella*, a large and powerful member of the antelope family, inhabiting the plains of South Africa. It equals the domestic ass in size, has a short, erect mane, a long, sweeping, black tail, and long, sharp-pointed, heavy horns, nearly straight from base to tip, and obscurely ringed throughout the lower half. By the aid of these natural bayonets it can easily defend itself from the smaller Carnivora, and it has been known to drive off, and even kill, the lion himself, when attacked by him.

Gendarmes (zhäṇ-därm), the name originally given in France to the whole body of armed men, but after the introduction of standing armies to a body of heavy-armed cavalry, which composed the chief strength of the forces. Gendarmes are now the French armed police. They are all picked men; they are usually taken from the regular forces, and are of tried courage or approved conduct. There are *horse gendarmes* and *foot gendarmes*. They are formed into small parties called *brigades;* and the union of a number of these forms a *departmental company*.

Gender (jen'der), in grammar one of those classes or categories into which words are divided according to the sex, natural or metaphorical, of the beings and things they denote. It may be exhibited by a class of words marked by similarity in termination, the termination having attached to it a distinction in sex, as seen in nouns, adjectives, participles, etc. There are three genders in all: *masculine*, *feminine*, and *neuter*, but these three distinctions only exist in some languages. In Sanskrit, Greek, and Latin all three are present, as also in German and English. English words expressing males are said to be of the *masculine* gender; those expressing females, of the *feminine* gender; and words expressing things having no sex are of the *neuter*, or *neither* gender. Gender is thus coincident with sex in English, and is a very simple matter. But in other languages sex and gender have little or no necessary relation, the majority of the names applied to inanimate objects being either masculine or feminine, and the grounds for such distinction being quite obscure. In the languages derived from the Latin—Italian, French, Spanish, and Portuguese—a neuter gender is not recognized. In the highly inflected languages there are certain terminations distinctive of the different genders, but in English gender only to a slight extent depends on the form of the word—*ess*, for instance, is a feminine termination. In English the gender of a noun only affects the pronoun substituted for it.

Genealogy (je-ne-al'ō-ji), the systematical investigation and exhibition of the origin, descent, and relations of families (or their *pedigree*). Persons descended from a common father constitute a family. Under the idea of *degree* of relationship is denoted the nearness or remoteness of relationship in which one person stands with respect to another. A series of several persons, descended from a common progenitor, is called a *line*. A line is either *direct* or *collateral*. The collateral lines comprehend the several lines which unite in a common progenitor. For illustrating descent and relationship genealogical tables are constructed, the order of which depends on the end in view. The common form of genealogical tables places the common stock at the head, and shows the degree of each descendant by lines. Some tables, however, have been constructed in the form of a tree, in which the progenitor (German, *Stammvater*) is placed beneath, as if for a root.

General (jen'er-al), the commander of an army, or of a division or brigade; the highest military title, with the exception of that of field-marshal. In the United States service there are three ranks, the highest *general*, the second *major-general*, and the lowest *brigadier-general*, the last being immediately above a colonel, as in other services. In Britain three similar ranks exist, their titles being *general*, *lieutenant-general* and *major-general*. *General*, in the Roman Catholic Church, is the title given to the supreme head, under the pope, of a monastic order. In most of the orders he is elected for three years, or some other fixed term, by the Jesuits for life, but the election must be confirmed by the pope.

General Assembly. See *Assembly* (*General*).

Generalization (jen-er-al-i-zā'shun), in logic, is the act of comprehending, under a common name, several objects agreeing in some point which we abstract from each of them, and which that common term serves to indicate.

General Lien (lēn), in law, is the right to retain possession of a chattel until payment be made, not only of any debt due in respect of that particular chattel, but of any balance that may be due on general account in the same line of business. General liens do not exist at common law, but depend entirely upon contract express or

implied from the special usage of dealing between the parties.

General Paralysis, known also as General Paralysis of the Insane, Dementia Paralytica, and Progressive General Paralysis, is a disease due to the progressive destruction of the nerve cells of the brain cortex and to hypertrophy of the supporting connective tissue, and is frequently attended by spinal complications. It occurs most commonly in adult males, and can almost always be traced to syphilitic or alcoholic degeneration. Later research, instituted by the growing frequency of this disease and its serious character, has resulted in the conclusion that it is a parasyphilitic type of disease. The *spirochæta pallida*, the essential germ-organism of syphilis, is present in the central nervous system of a large proportion of the cases of general paralysis, and nearly all of them give a positive Wassermann reaction. The presence of an organism resembling the Klebs-Loeffler bacillus has been detected, and for a time it was held that the disease was due to a bacterial toxin; but this theory has since been abandoned, and it is now believed that if these bacteria play any part in the progress of the malady, it is of secondary importance. The symptoms of general paralysis may be divided into mental, sensory and motor. The mental symptoms are characterized by lack of adjustment, lack of will power, indecision and irritability; also by moral perversions, as indecent exposure, criminal assault, theft and various minor offenses. Among the sensory symptoms, loss of sight and hearing, formications and anesthesias are common. The motor symptoms are marked by the loss of power of expression by speech or in writing, aphasia, irregular gait and a change in the pupillary reflex. The mental defect associated with these departures from the normal may assume various forms, as alternating periods of excitement and depression, with periods in between of a return to the normal state. This is the so-called paralysis of double or circular form. The second group shows a progressively increasing loss of mental power, the memory, business capacity and will power gradually deteriorating, with only slightly marked evidence of depression or excitement. A third group comprises cases of expansive delirium or maniacal excitement. Extravagant delusions as to the wealth and power, and extreme excitement passing into homicidal mania, are distinguishing features of this class. In a fourth group depression associated with loss of memory and with delusions is a marked symptom. All cases gravitate toward dementia. In the early stages of the disease the physical signs may not be marked. But usually the onset of the malady is characterized by stolidity of countenance, tremulous lips, hindered and blurred articulation, associated with a tremor of the hand and arm which interferes with writing, and an ataxic or spastic gait. The patient is also liable to epileptic or apoplectic seizures. The stage of complete paralysis supervenes. The patient is a physical and mental wreck, bed-ridden, utterly helpless, unable to retain fæces or urine. Death results from exhaustion, in coma or convulsions, from heart failure or lung complications. Recovery from general paralysis is at present of rare occurrence, though recoveries have been reported, taking place before the advanced stages were reached.

General Ship, in maritime law, is a ship announced by the owners to take goods from a particular port at a specified time, and which is not under special contract to particular individuals.

General Staff, is that part of army organization which consists of a number of officers selected for their special fitness to aid in carrying out the principles of military procedure as formulated by the general commanding officer. The body of the general staff had its origin in Germany, where a number of officers, not attached to any corps, were appointed to prepare maps, strategical schemes, and statistics regarding the relative strength of armies. It is to be distinguished from the company of general officers surrounding a commander in the field of war. In the United States the General Staff Corps was created by act of Congress, February 14, 1903. It is governed by rules prescribed by the President, and is made up of about fifty officers who are detailed for a period of four years. Their duties consist in studying the efficiency and strength of the army, plans for defense, mobilization and strategic positions (in time of war).

General Theological Seminary, situated in Manhattan Borough, N. Y., and founded in 1817, is the chief seminary of the Protestant Episcopal Church of America. After many years of financial difficulty it was placed on an independent basis by the gifts of Dean Hoffman, who administered its affairs (1878–1902). It has both an ordinary course of three years and a post-graduate course. It confers the degrees of B.D. and D.D., the latter of which is both academic and honorary. No fees are charged for its tuition, and there are many valuable prizes. Its statistics, in 1922 were: faculty, 16; students, 100; library, 60,000 volumes.

Generalization, the act of comprehending under a general name a number of objects which agree in one or more points. The general term stands for the many objects in so far only as they all agree. This process is akin to classification and definition; and the higher form of it is induction.

Generation (jen-er-ā'shun), a single succession of human beings (or animals) who are born, grow up, and reproduce their kind; hence, an age or period of time between one succession and the next, as the third, the fourth, or the tenth generation. The length of a human generation is usually estimated at about thirty years.

Generation. See *Reproduction.*

Generation, ALTERNATE, or METAGENESIS, that kind of multiplication, seen in some invertebrate animals or even in plants, in which parents produce progeny unlike, sometimes extremely unlike, themselves, while this unlike progeny give rise to others resembling the original forms. Sometimes there are more than one unlike form between these like forms. The Hydrozoa abundantly illustrate this phenomenon, also the Echinoderms, Polyzoa, Tunicata, the wheel animalcules, Nematoid worms, flatworms, tapeworms, several of the true Annelids among Crustaceans, Daphnia, the Phyllopods among Insects, the plant-lice. The steps may be seen in certain of the Hydroid Polyps, thus: (1) There is an ovum or egg, free-swimming and impregnated. (2) This ovum attaches itself to a fixed submarine object, and develops into an organized animal. (3) This organism produces buds or zooids, often of two kinds—one set nutritive, the other generative—unlike each other and unlike their parent, the whole forming a hydroid colony. (4) The generative set mature eggs, which on being liberated become the free-swimming ova (No. 1), and the cycle is renewed. A somewhat similar phenomenon is that of *Parthenogenesis* (which see).

Generation, SPONTANEOUS, or ABIOGENESIS, the doctrine that living matter may originate spontaneously, 'that under certain circumstances dead matter may build itself up into living matter without the intervention of already existing protoplasm.' In the 17th century this was the dominant view, sanctioned alike by antiquity and authority, and was first assailed by Redi, an Italian philosopher. Buffon held the doctrine in a very modified degree. He held that life is the indefeasible property of certain indestructible molecules of matter which exist in all living things, and have inherent activities by which they are distinguished from non-living matter. Of course it is only animals or plants of very low type and minute size that have been supposed to be produced spontaneously, and the readiness with which such appear lends plausibility to the theory. Experiments of recent date, moreover, seem to point to the spontaneous origin of life. Dr. H. Charlton Bastian and others claim that they succeeded in obtaining living organisms from certain chemical solutions. Dr. Edward A. Schafer, of the British Association for the Advancement of Science, points out that biology tends to obliterate the line between living and non-living matter.

Generator. See *Dynamo.*

Generic Name (je-ner'ik), in natural history, the denomination which comprehends all the species of a genus; thus *Canis* is the *generic* name of animals of the dog kind; *Felis*, of the cat kind; *Cervus*, of the deer kind. See *Genus.*

Genesee (jen-e-sē'), a river of the United States, which rises in Pennsylvania, flows north through New York, and falls into Lake Ontario 6 miles below Rochester, after a course of 145 miles. It is notable for its varied and romantic scenery, and its extraordinary falls. These falls are five in number: three of them occur about 90 miles from the mouth of the river, and are respectively 60, 90 and 110 feet high. The other two are near Rochester, and are both about 100 feet high.

Genesis (jen'e-sis; Greek, creation, birth, origin), the first book of the Bible and of the Pentateuch, named in the Hebrew canon *B'reshith* ('In the *Beginning*'), from the term with which it commences. From the Greek translators it received the name it is now commonly known by. Genesis consists of two great but closely connected divisions:—(1) The history of the creation, the fall of man, the flood, the dispersion of the human race, chap. i-xi. (2) The history of the fathers of the Jewish race, chap. xii-l. A certain apparent difference of style and language, the occurrence of what seem gaps on the one hand, and repetitions and contradictions on the other, and the different use of the term for the divine name (*Jehovah*, Everlasting; and *Elohim*, Almighty), led very early to the question of the integrity of the book, and various critics declare that larger or smaller interpolations have been made in the original text.

Genet (jen'et), a digitigrade carnivorous mammal of the family Viverridæ. The genus *Genetta* contains five species, the best known of which is the *G. vulgāris*, the common genet, whose range extends all around the Mediterranean, including Western Asia, Northern Africa, and Southern Europe. It is about the size of a small cat, but of a longer form, with a sharp-pointed snout, upright ears, and a long tail. It has a beautiful soft fur, and, like the civet, produces an agreeable perfume. The habits of the genet are like those of the weasel tribe; it is easily tamed, and is sometimes employed in Constantinople and elsewhere to catch rats and mice.

Geneva (je-nē'va; German, *Genf;* French, *Genève*), a town of Switzerland, capital of the canton of the same name, situated at the western extremity of the Lake of Geneva, where the Rhône issues, here crossed by several bridges, and dividing the town into two portions, the larger and more important of which is on the left or south bank. The environs are covered with handsome villas, and the town itself, when approached either by land or water, has a very attractive appearance. It was formerly surrounded by walls and regular fortifications, but since 1850 these have been removed. The town is divided into two parts, an upper and a lower. The upper town, occupied chiefly by the wealthier citizens, consists of well built houses and handsome hotels; the lower town, the seat of trade and residence of the poorer classes, consists largely of houses remarkable for their height, and lining narrow, irregular, dark, and ill-cleaned streets; but great improvements have recently been carried out. The more important public buildings are the cathedral or Church of St. Pierre, a Gothic structure of the 10th, 11th, and 12th centuries, occupying the highest site in the town, and by its three towers forming the most conspicuous object within it, somewhat defaced externally by a very incongruous Greek peristyle; the town-house in the Florentine style; the Musée Rath containing a collection of pictures and other works of art; the university building, nearly opposite the botanic garden, rebuilt in 1867-71, and containing the public library, founded by Bonivard, the prisoner of Chillon, in 1551, and now numbering 90,000 vols.; and the museum of natural history. The only important manufactures of Geneva are those of watches, musical boxes, and jewelry, for all of which the town is justly famed. Geneva has ample railway communication, and is one of the principal entrances for tourists and travelers into Switzerland. In literature and science Geneva has long occupied a distinguished place, and it has been the birthplace or the residence of many eminent men, including Calvin, Beza, Knox, Le Sage, Necker, De Candolle, Rousseau, Sismondi, etc. Geneva early adopted the principles of the Reformation, and chiefly through the teaching of Calvin, the town acquired an important influence over the spiritual life of Europe, and became the center of education for the Protestant youth of Britain, France, and Germany. Pop. 105,-710.—The canton is bounded by the canton of Vaud and the Lake of Geneva, and by France. Area, 109 sq. miles. It belongs to the basin of the Rhône, and the only streams of importance are that river and the Arve, which joins it a little below the town of Geneva. The soil has been so much improved by skillful and preserving culture that abundant crops of all kinds suitable to the climate are raised, and the whole territory wears the appearance of a garden. Manufactures consist chiefly of clocks and watches, musical boxes, mathematical instruments, gold, silver, and other metal wares, woolen cloths, and silk goods of various descriptions, hats, leather, and articles in leather; and there are numerous cotton mills, calico printing works, and dye works. The territory of Geneva having, by the arrangements of the Congress of Vienna, obtained an accession of fifteen communes, detached from France and Savoy, was admitted a member of the Swiss Confederation in 1814, and ranks as the twenty-second canton. Its constitution of 1848 is the most democratic in the federation. All religious denominations are declared to have perfect freedom, but two of them are paid by the state—the Roman Catholics, amounting to rather more than a third of the population, and the Protestant National Church. Pop. 140,900.

Geneva, a city of Ontario Co., New York, on Seneca Lake, in the heart of the Finger Lakes Region, on the Lehigh Valley and New York Central railroads. Seat of Hobart College, for men; William Smith College, for women; and a State experiment station. It is the center of the nursery business, also of the optical business. Other products are razors, stoves, radiators, boilers, etc. Pop. (1910) 12,446; (1920) 14,648.

Geneva, LAKE OF, or LAKE LEMAN (Latin, *Lacus Lemanus*), the largest of the Swiss lakes, extending in the form of a crescent, with its horns pointing southward, between France on the south, and the cantons of Geneva,

Vaud, and Valais: length, measured on its north shore, 55 miles, and on its south shore, 40 miles; central breadth, about 6 miles; area, 331 sq. miles; greatest depth, 900 feet. It is 1150 feet above the sea. On the north the shore is low, and the ground behind ascends gradually in beautiful slopes. On the south, and particularly at the east end, the shore is rocky and abrupt, and lofty precipices often rise sheer from the water's edge. It contains various species of fish, and its water is remarkably pure and of a beautiful blue color. The Rhône, which enters its eastern extremity a muddy turbid stream, issues from its western extremity perfectly pellucid, and likewise of the finest blue.

Geneva Arbitration. See *Alabama (The)*.

Geneva Bible, a copy of the Bible in English, printed at Geneva; first in 1560. This copy was in common use in England till the version made by the order of James I was introduced, and it was laid aside by the Calvinists with reluctance. It was the first which divided the text into verses and the first to omit the apocrypha. From its stating (Gen., iii, 7) that our first parents made themselves 'breeches,' it is sometimes known as the Breeches' Bible.

Geneva Convention, an agreement concluded at an international conference held in Geneva in 1864, for the succor of the sick and wounded in time of actual warfare. The neutrality of hospitals, ambulances, and the persons attending on them was provided for; and the use of the red cross on a white ground as a sign of neutrality has received the adhesion of all civilized powers. Those wearing it are known as the Red Cross Society (*q. v.*).

Geneviève (jen'e-vēv, *Fr.* zhēn-vi-āv), the name of two female saints.—1. St. Geneviève, the patron saint of Paris; born at Nanterre, about 5 miles from Paris, in the year 423; died at Paris about the beginning of the 6th century. She devoted herself while yet a child to the conventual life. Her prayers and fastings are credited with having saved Paris from the threatened destruction by Attila in 451. Many legends are told respecting her, and several churches have been dedicated to her. Her festival is held on the 3d January.—2. St. Geneviève, by birth Duchess of Brabant, wife of Siegfried, count palatine in the reign of Charles Martel (about 750). According to the legend, which is the subject of several tales and dramas, she was accused of adultery during her husband's absence and condemned to death; but was allowed to escape, and she lived six years in a cavern upon nothing but herbs. She was finally found, and carried home by her husband, who in the meantime had become convinced of her innocence.

Genghis Khan, or JENGHIS KHAN (jen'gis), a Mongol conqueror, born about 1160; died 1227. His father was chief over thirty or forty clans, but paid tribute to the Tartar khan. He succeeded his father when only fourteen years of age, and made himself master of the neighboring tribes. A great number of tribes now combined their forces against him, but he found a powerful protector in the great Khan of the Karaite Mongols, Oung, or Ung, who gave him his daughter in marriage. After much internecine warfare with various Tartar tribes and many victories Genghis was proclaimed Khan of the United Mongol and Tartar tribes. He now professed to have a divine call to conquer the world, and the idea so animated the spirit of his soldiers that they were easily led on to new wars. The country of the Uigurs, in the center of Tartary, had long excited his ambition. This nation was easily subdued, and Genghis Khan was now master of the greatest part of Tartary. Leading his tribes to conquest in 1209, he passed the great wall of China, the conquest of China occupying him more than six years. The capital, then called *Yenking*, now *Peking*, was taken by storm in 1215 and plundered. The murder of the ambassadors whom Genghis Khan had sent to the King of Kharism (now Khiva) led to his invasion of Turkestan in 1218 with an army of 700,000 men and the two cities of Bokhara and Samarcand were stormed, pillaged, and burned. Seven years in succession was the conqueror busy in the work of destruction, pillage, and subjugation, and extended his ravages to the banks of the Dnieper in Europe. In 1225, though more than sixty years old, he marched in person at the head of his whole army against the king of Tangut (Southwestern China), who had given shelter to two of his enemies, and had refused to give them up. A great battle was fought, in which the King of Tangut was totally defeated with the loss of 300,000 men. The victor remained some time in his newly subdued provinces, from which he also sent two of his sons to complete the conquest of Northern China. At his death his immense dominions were divided among his four sons.

Genii (jē'ni-ī). See *Genius*.

Genipap (jin'i-pap; *Genipapo*, the Guiana name), the fruit of a South American and West Indian

tree, the *Genipa Americana*, nat. order Rubiaceæ. It is about the size of an orange, and of a pleasant vinous flavor.

Genista (jin-is'ta), a genus of leguminous plants, comprising about 100 species, one of which is the *Planta genista*, the *Plante genêt*, from which the Plantagenets took their name. The *Genista tinctoria*, or dyer's broom, so called, as it was formerly much employed by dyers, who obtained a good fixed yellow or orange color from it, is frequent in England and the lowlands of Scotland.

Genitive Case (jen'i-tiv), in grammar, a case in the declension of nouns, adjectives, pronouns, participles, etc., expressing source, origin, possession, and the like. In English grammar the corresponding case is the possessive case.

Genius (jē'nyus), a tutelary deity; the ruling and protecting power of men, places, or things; a good or evil spirit supposed to be attached to a person and influence his actions. The Genii of the Romans were the same as the *Daimŏnes* (Demons) of the Greeks. According to the belief of the Romans, which was common to almost all nations, every person had his own Genius; that is, a spiritual being, which introduced him into life, accompanied him during the course of it, and again conducted him out of the world at the close of his career. The Genii of women were called *Junones*. The Genii were wholly distinct from the *Manes*, *Lares*, and *Penates*, though they were allied in one important feature—the protection of mortals.

The term *genii* (with the singular *genie*) is also used as equivalent to the *jinn* (singular *jinnee*) of Arabic tales. These are supposed to be a class of intermediate beings between angels and men. See *Jinn*.

Genlis (zȧn-lēs), Stéphanie Félicité Ducrest de St. Aubin, Countess de, a French authoress, born near Autun 1746; died at Paris 1830. At four years of age she was admitted as a canoness into the noble chapter at Aix, and at seventeen married the Count de Genlis. By this marriage she became niece to Madame de Montesson (who had been privately married to the Duc d'Orleans), and obtained through her the place of lady-in-waiting to the Duchesse de Chartres. In 1782 the Duc de Chartres (Philippe Egalité) appointed her governess of his children. She obtained great influence over her employer, and was the object of no little scandal in her relations with him, which was strengthened by the mysterious appearance of an adopted daughter, afterwards known by the name of Pamela, who married Lord Edward Fitzgerald. At this time she published several works on education, etc. On the breaking out of the Revolution she retired for a while to Switzerland, and then to Altona. In 1800 she returned to France, gained the favor of Napoleon, who gave her a pension. From that time she resided constantly in Paris. Her works, which embrace a wide variety of subjects, amount altogether to about ninety volumes, and include some of the standard novels in the French language. Her voluminous *Mémoires*, written when she was upwards of eighty years of age, abound in scandal, and are full of malignant attacks upon her contemporaries.

Gennesaret (jen-es'a-ret), Sea of. See *Galilee* (*Sea of*).

Genoa (jen'o-a; Ital. *Genŏva*, '*La superba*'), a seaport of N. Italy, the chief commercial city of the kingdom, on the coast of the Mediterranean, at the head of the gulf of the same name, 75 miles S. E. of Turin. It is beautifully situated at the foot and on the slope of the Ligurian Alps, the lower hills of which form a background to the city. It is enclosed by extensive fortifications, and the heights around are crowned with detached forts. It has a most imposing effect when approached either by land or sea. In the older parts of the town the streets are extremely narrow, with lofty buildings on either side. In the newer quarters many of them are spacious, and are lined with palaces and other noble edifices. Some of the palaces are filled with works of art by the greatest masters. The principal are—the Ducal palace (now containing the law courts and various public offices), the Palazzo del Municipio or town-hall, the Palazzo Brignole or Rosso (with the largest picture gallery in Genoa), the Palazzo Pallavicini, the Palazzo Reale, built in the sixteenth century for the Durazzo family, was purchased in 1815 by the royal family, and the palaces of Doria, Serra, Cambasio, Balbi, and Durazzo. The most remarkable of the churches is the Duomo, or Cathedral of St. Lorenzo, founded in the eleventh century, but not completed till the beginning of the twelfth; S. Maria in Carignano, built in imitation of the original plan of St. Peter's at Rome; S. Stefano, a Gothic church, the oldest parts of which date from the end of the twelfth century; S. Ambrogio, containing two paintings by Rubens and the Assumption of Guido Reni. The principal charitable institution is the Albergo de' Poveri, in which 1600 individuals, orphans and old people,

find shelter. Others are the Ospedale del Pammatone founded in 1430; and a hospital recently built by the Galliera family. Among the theaters of the city may be mentioned the Teatro Carlo Felice, an elegant structure, with a splendidly fitted up interior. Besides the university, founded in 1775, the chief educational institutions are the theological seminary, the school of fine arts, the royal marine school, and the navigation school. The building of the Bank of St. George, one of the most ancient banks of circulation and deposit in Europe, is now used as a custom-house. In one of the open spaces there is a fine marble statue of Columbus, with accompanying allegorical figures. The Campo Santo, or

Strada Balbi, Genoa.

cemetery, about 2½ miles from the city, is one of the most beautiful burial grounds in Europe. It contains fine mortuary buildings and much statuary in white marble. The manufactures of Genoa include cotton and silk goods, gold, silver, paper and leather goods, sugar, and preserved fruits. The old harbor, which is of a semicircular form and about ¾ mile in diameter, is formed by two moles projecting into the sea from opposite sides; there are now also two outer or additional harbors formed by moles recently constructed. The principal articles of export are cereals, oils, fruit, cheese, rags, the products of its manufactures, etc. Many emigrants embark here. Imports—cotton, wool, wheat, sugar, coffee, coal, hides, iron, etc.

Under the Romans Genoa was famous as a seaport. After the breaking up of the empire of Charlemagne, it constituted itself a republic, presided over by doges. From 1119 it was almost constantly at war with Pisa down to 1284, when Genoa inflicted a crushing defeat on Pisa. The Genoese obtained the supremacy over Corsica, and nominally over Sardinia, possessed settlements in the Levant, on the shores of the Black Sea, on the Spanish and Barbary coasts, and had a very flourishing commerce. The rivalry between Genoa and Venice was a fruitful source of wars during the 12th-14th centuries. Meanwhile the city was internally convulsed by civil discord and party spirit. The hostility of the democrats and aristocrats, and the different parties among the latter, occasioned continual disorder. From the contests of noble rivals, in which the names of Doria, Spinola, Grimaldi, and Fieschi are prominent. Genoa was drawn into the Guelph and Ghibelline contest. In the absence of internal tranquillity the city sometimes submitted to a foreign yoke in order to get rid of anarchy. In the midst of this confusion St. George's Bank was founded. It owed its origin to the loans furnished by the wealthy citizens to the state, and was conscientiously supported by the alternately dominant parties. In 1528 the disturbed state regained tranquillity and order, which lasted till the end of the eighteenth century. The form of government established was a strict aristocracy. The nobility were divided into two classes—the old and new. To the old belonged, besides the families of Grimaldi, Fieschi, Doria, Spinola, twenty-four others, who stood nearest them in age, wealth, and consequence. The new nobility comprised 437 families. By little and little Genoa lost all her foreign possessions. Corsica, the last of all, revolted in 1730, and was ceded in 1768 to France. After the battle of Marengo (1800) Genoa was taken possession of by the French. In 1805 it was formally annexed to the Empire of France, in 1815 to the Kingdom of Sardinia, with which it has become a portion of the Kingdom of Italy. Pop. (1911) 272,221.

Genoa, Gulf of, a large indentation of the Mediterranean, in North Italy, at the head of which lies the city and port of Genoa. No precise points can be named as marking its entrance; but it may, perhaps, be generally said to comprise the entire space north of lat. 43° 40′ N.

Genre-painting (zhäṇ-r), that department of painting in which are depicted scenes of everyday life, in opposition, for instance, to historical painting, in which historic personages are exhibited, or to landscape.

Gens (jens), in Roman history, a clan or stock embracing several families united together by a common name and certain religious rites; as, the Fabian *gens*, all having *Fabius* as part of their personal name; the Julian *gens*, all named Julius; the Cornelian *gens*, etc.

Gens D'Armes. See *Gendarmes.*

Genseric (jen'sėr-ik), a king of the Vandals, who, having obtained joint possession of the throne of Spain with his brother Gonderic, crossed the Straits of Gibraltar with 50,000 men, A.D. 429, on the invitation of Bonifacius, the Roman governor of Africa, to assist him against the Moors. He, however, soon declared his independence, and, having completely defeated Bonifacius, founded a kingdom, which, in 439, had its seat at Carthage. He collected a powerful fleet, ravaged the coasts of Sicily and Italy, and in 455 took and sacked Rome. Two unsuccessful attempts were made by the Eastern and Western emperors to overthrow his power, but Genseric secured all his conquests, and, notwithstanding all his cruelties, was permitted to die in peace A.D. 477.

Gentian (jen'shan), the name given to the members of the genus *Gentiāna* (order Gentianaceæ), a large genus of bitter herbaceous plants, having opposite, often strongly ribbed, leaves, and blue, yellow, or red, often showy flowers. The calyx consists of four or five valvate segments, and the corolla is four or five parted; the fruit is a two-valved, one-celled, many-sided capsule. They are for the most part natives of hilly or mountainous districts in the northern hemisphere. The most important species is *Gentiāna lutĕa*, a native of Switzerland and the mountainous parts of Germany. The root has a yellowish brown color and a very bitter taste, and is imported into the United States in considerable quantities, where it is used medicinally, and also as an ingredient of cattle foods. In Switzerland and Bavaria a liqueur called Enziangeist or 'gentian-spirit' is made from it. Many of the blue-flowered species, as *G. acaulis*, *G. nivālis*, and *G. verna*, are among the most conspicuous and ornamental of European Alpine plants. America has several attractive species.

Yellow Gentian (*Gentiana lutĕa*).

Gentianaceæ (jen-shan-ā'se-ē), the gentians, an order of monopetalous exogens, consisting mostly of annual or perennial herbaceous plants, with opposite often connate entire leaves, and yellow, red, blue, or white flowers, which are borne in dichotomous or trichotomous cymes or in globose terminal heads. All are characterized by their bitter principle. The order contains about 520 species, which are widely dispersed throughout the world, occurring most plentifully in temperate mountainous regions. Some very handsome species are tropical, while a few occur in Arctic latitudes.

Gentile (jen'tīl), in Scripture, any one belonging to the non-Jewish nations and not a Christian; a heathen. The Hebrews included in the term *goim*, or nations, all the tribes of men who had not received the true faith, and were not circumcised. The Christians translated *Goim* by the L. *gentes*, nations, and imitated the Jews in giving the name *gentiles* to all nations who were not Jews or Christians. In civil affairs the denomination was given to all nations who were not Romans.

Gentleman (jen'tl-man), in English law, every man above the rank of yeomen, including noblemen; in a more limited sense, a man who without a title bears a coat of arms, or one who is 'a gentleman by reputation,' through belonging to some liberal profession or holding some office giving him this rank. In the United States it properly indicates a man of gentle or refined manners, but has lost this sense in its very general application.

Gentlemen-at-Arms, a body of forty gentlemen, headed by a captain, lieutenant, and standard-bearer, whose duties are to form a bodyguard to the British sovereign on state occasions. The corps was established by Henry VIII in 1509, under the name of the Band of Gentlemen Pensioners. Appointments to the corps are made by the sovereign, from a special list of retired officers kept by the commander-in-chief.

Gentoo (jen-tō'), a term applied by old writers to a native of Hindustan, or to the language.

Gentz (gents), Friedrich Von, a German diplomatist and publicist, born 1764; died 1832. He was

secretary to the directory of finances at Berlin when the French Revolution broke out, of which he was an ardent opponent. He served alternately in the Prussian and Austrian civil service, and his pamphlets and manifestoes proved formidable obstacles to the invasions of Napoleon. He took part in the congresses of Vienna and Paris, as well as in others. Among his various works was a life of *Mary, Queen of Scots.*

Genuflexion (jen-ū-flek'shun; from the Latin *genu*, knee, and *flectere*, to bend), the act of bending the knees in worship. There are frequent allusions to genuflexion in the Old and New Testaments, and it would appear that the use was continued among the early Christians. Genuflexion obtains, both by rule and prescription, in various places in the offices of the Roman Catholic Church, and at different parts of the services of the Church of England.

Genus (jē'nus), in scientific classification, an assemblage of species possessing certain characters in common, by which they are distinguished from all others. It is subordinate to *order, tribe,* and *family.* A single species, possessing certain peculiar characters which belong to no other species, may also constitute a genus, as the giraffe.

Geodes (jē'ōdz), round hollow nodules, containing sometimes earthy matters, sometimes a deposit of agate, sometimes quartz and spars crystallized. They are found more or less in all volcanic rocks, and have been formed by water depositing their materials in the hollows of those rocks.

Geodesy (jē-od'e-si), the science of surveying extended to large tracts of country; the branch of applied mathematics which determines the general figure and dimensions of the earth, the variations of the intensity of gravity in different regions, etc., by means of direct observation and measurement. See *Trigonometrical Survey.*

Geoffrey of Monmouth (jef'rā; called also *Geoffrey ap Arthur*), an ecclesiastic and historian of the twelfth century. He sprang from the Norman settlers in Wales; became archdeacon of Monmouth, whence he was, in 1152, raised to the bishopric of St. Asaph. He died in 1154. His famous history was first published in 1128. This *Chronicon sive Historia Britonum* is now known to be, as the compiler states, chiefly a translation from an ancient book in the Breton tongue, discovered by Walter Calenius, an archdeacon of Oxford. It contains a pretended genealogy of the kings of Britain from the time of the fabulous Brutus, or Brute, the Trojan, to the death of Cadwallader, King of Wessex, in 688. It was soon translated into French, English, and Welsh, and became a great source of romance to the writers of successive generations.

Geoffroy St. Hilaire (zhof-rwȧ saṇ tē-lār), ETIENNE, a French naturalist, born in 1772; died in 1844. He was educated at the colleges of Navarre and Lemoine, and became a favorite pupil of Haüy. At the age of twenty-one he obtained the chair of zoology in the Parisian Jardin des Plantes. As a member of the Egyptian expedition in 1798 he founded the Institute of Cairo, and returned about the end of 1801 with a rich collection of zoological specimens. In 1807 he was made a member of the Institute, and in 1809 professor of zoology at the Faculty of Sciences. He devoted himself especially to the philosophy of natural history. The fundamental idea brought conspicuously forward in all his works is, that in the organization of animals there is only one general plan, one original type, which is modified in particular points so as to present differences of genera. This view met with strong opposition from Cuvier. Among his principal works are *Sur le Principe de l'Unité de Composition Organique; Philosophie Anatomique; Histoire Naturelle des Mammifères,* written in conjunction with Cuvier, and *Notions de Philosophie Naturelle* (1838).

Geoffroy St. Hilaire, ISIDORE physiologist and naturalist, son of the preceding, was born at Paris in 1805; died in 1861. He devoted himself to natural history, and in 1824 was appointed assistant to his father at the Jardin des Plantes. He was elected to the Academy of Sciences in 1833, and afterwards became successively inspector-general of the university, member of the council of public instruction, and professor of zoology at the Academy of Sciences. One of his chief works, *Histoire Générale et Particulière des Anomalies de l'Organisation chez l'Homme et les Animaux,* adds valuable confirmation to the theories of his father. He was the means of founding the Acclimatization Society of Paris.

Geognosy (jē-og'nu-si), a term which originated among the German mineralogists, and is nearly synonymous with *geology.* It is the science of the substances which compose the earth or its crust, their structure, position, relative situation and properties.

Geographical Societies (jē-o-grof'-i-kal) are associations formed with the view of obtaining and disseminating geographical knowledge. Of these, the first was founded in Paris in 1821; the second, the Royal Geographical Society of England, in 1830; the American Geographical Society at New York in 1852, and others elsewhere at various dates. The National Geographic Society, founded at Washington in 1888, has an enormous membership, numbering considerably over 100,000 due to the circulation of its richly illustrated monthly magazine.

Geography (jē-og'-ra-fi; from the Greek *gē*, earth, and *graphō*, I write), the science which treats of the world and its inhabitants, giving an account of the earth as a whole, and of the divisions of its surface, natural and artificial, describing the different countries, states, provinces, islands, cities, etc. It may be regarded as embracing several departments or branches. *Mathematical Geography* is that branch of the general science which is derived from the application of mathematical truths to the figure of the earth, and which determines the relative positions of places, their longitudes and latitudes, the different lines and circles imagined to be drawn upon the earth's surface, their measurement, distance, etc. *Physical Geography* treats of the physical condition of the earth, its great natural divisions of land and water, the atmosphere, and the movements of oceanic and aërial currents; the geological structure of the earth; and the natural products of the earth, vegetable and animal. It is concerned chiefly with general laws and principles, as they are manifested upon a grand scale, and in the organic kingdom with the existence of groups of animals and plants. This branch approaches at various points the sciences of geology, hydrology, meteorology, botany, zoology, and ethnology. *Political Geography* embraces the description of the political or arbitrary divisions and limits of empires, kingdoms, and states; and treats of their government, laws, social organizations, etc. *Commercial Geography* has to do with the distribution of the products of the earth or the workship between different nations.

The earliest idea of the earth formed by mankind seems to have been that it was an immense disc, in the center of which their own land was situated, surrounded by the ocean, and covered by the sky as with a canopy. The Phœnicians were the first people who made any great progress in extending the bounds of geographical knowledge. They seem to have explored all the shores of the Mediterranean, and at an early period to have passed the Pillars of Hercules (by the Strait of Gibraltar), and visited to some extent the Atlantic shores of Europe and Africa, extending their voyages as far north as Britain, and as far south as the Tropic of Capricorn. In the Homeric poems (which may be regarded as representative of the ideas entertained by the Greeks about the commencement of the ninth century B. C.) the earth is supposed to resemble a circular shield surrounded by a belt of water which was the source of all other streams. The world of Herodotus (born 484 B.C.) extended from the Atlantic to the western boundary of Persia, and from the Red Sea or Indian Ocean to the amber lands of the Baltic. The Indian expedition of Alexander the Great (330 B.C.) greatly enlarged the ancient knowledge of Northern and Eastern Asia. About 320 B.C. Pytheas, a seaman of Massilia (ancient Marseilles), a Greek colony, sailed along the western coasts of Spain and Gaul, visited Britain, and, pursuing his voyage, discovered an island, henceforward famous as *Ultima Thule*, which is supposed to have been Iceland. Eratosthenes (276-196 B.C.) first used parallels of latitude and longitude, and constructed maps on mathematical principles. He considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one center. The *Geography* of Strabo, a Greek of Pontus, written about the beginning of the Christian era, embodies all that was known of the science at that period. The countries lying round the Mediterranean were known with tolerable accuracy, but the Atlantic shores of Europe were very vaguely comprehended, while of the northern and eastern portions the most erroneous notions prevailed. Pomponius Mela, an early Roman geographer, wrote about the time of the Emperor Claudius. He divided the world into two hemispheres, the Northern or known and the Southern or unknown; the former comprising Europe N. of the Mediterranean and W. of the Tanais (Don); Africa S. of the Mediterranean and W. of the Nile; and Asia. The next famous geographer is Ptolemy, who lived at Alexandria about the middle of the second century A.D. In Europe, Spain and Gaul were now correctly delineated, together with the southern shores of Britain. Northern Germany and the southern shores of the Baltic were pretty well known, as also some portion of Russia in the neighbor-

hood of that sea, and the southern part of European Russia. In Asia it was considered certain that there were wide regions inhabited by nomadic tribes called Scythians, while from the far east came some vague reports of China. The *Geography* of Ptolemy remained the acknowledged authority during the whole of the middle ages. From his time up till the thirteenth century no advance was made in geographical knowledge until Marco Polo opened up new fields of inquiry. The account of his travels first made known to Europe the existence of Japan and of many of the East Indian islands and countries. Then followed the discovery of America in 1492, and from this time forward the progress of discovery was extremely rapid. In 1497 the Cape of Good Hope was doubled by Vasco da Gama, four years after its discovery by Bartholomew Diaz. Within thirty years from the date of the first voyage of Columbus the whole of the east coast of America from Greenland to Cape Horn had been explored. In 1520 Magellan passed the straits which bear his name, and his vessel, crossing the Pacific and Indian Oceans, returned to Europe by way of the Cape of Good Hope, being the first that had circumnavigated the globe. The west coast of America was explored as far as the Bay of San Francisco about the middle of the sixteenth century. At the same time discovery in the east advanced with rapid strides. Within twenty years of Gama's arrival in India the coasts of East Africa, Arabia, Persia, and Hindustan had been explored, and many of the islands of the great Archipelago discovered. The expeditions of Willoughby and Frobisher in 1553 and 1576, of Davis in 1585, of Hudson in 1607, and of Baffin in 1616, though they failed in their object of finding a N. W. passage to India, materially enlarged our knowledge of the Arctic regions. By the middle of the seventeenth century the Dutch, under Tasman and Van Diemen, made the Australasian Islands known to the world. Late in the following century Captain Cook added largely to geographical knowledge by his survey of the Pacific and its innumerable islands. The Antarctic continent was discovered in 1840 by American, English, and French expeditions, and the northwest passage round North America was found by McClure in 1850. The travels of Humboldt, Spix and Martius, Lewis and Clark, Fremont, and others have made us acquainted with the general features of the American continent. In Asia numerous travelers have contributed much to render our knowledge certain and precise in respect to a great part of the continent. The interior of Australia has been explored by Sturt, Eyre, Leichhardt, Burke, Wills, King, McDouall Stuart, etc. The opening up of the African interior was materially advanced by the explorations of a host of travelers, including Bruce, Park, Denham, Clapperton, the Landers, Burton, Speke, Grant, Baker, Barth, Livingstone, Rohlfs, Schweinfurth, Cameron, Stanley, etc., and now is almost as well known as that of Europe and America. Within the present century great advances have been made in Arctic geography, the site of the North Pole having been reached in 1909 and that of the South Pole in 1911. The progress which has marked recent discovery has been materially assisted by the governments of various countries, and by the numerous geographical societies formed during the nineteenth century. The scientific study and teaching of geography are becoming more and more recognized to be of high importance, and in both at present Germany takes the lead. See also *Geographical Societies*, the articles on the different countries, and such articles as *Earth*, *Climate*, etc.

Geok Tepe (gŏk-te'pe), a town and fortress of Central Asia, oasis of the Akhal-Tekke-Turkomans, lon. 58° E., lat. 38° N. In 1879 the Russians under General Lomakine were defeated here with heavy loss, but in January, 1881, it was stormed by General Skobeleff after a three weeks' siege, when about 8,000 fugitives were massacred, no quarter being given.

Geological Surveys (jē-ol-oj'i-kal). Active efforts have been made by the states of this country to obtain a just idea of their geological conditions, the first movement being made by North Carolina in 1823, followed by Massachusetts in 1830, and by 11 more states in the succeeding decade, while by the end of the century nearly all the states had entered upon a systematic investigation of their rocks and minerals. Pennsylvania, New York, New Jersey, and some of the Eastern states did this work with a large degree of completeness. The United States government early entered upon similar work, sending out numerous expeditions, and a United States Geological Survey was organized in 1879, which diligently continued the work, its field of operations embracing the whole country. Great Britain was the first country in Europe to engage in a similar work, beginning in 1832. It has been followed by nearly all the countries of Europe and by its several colonies.

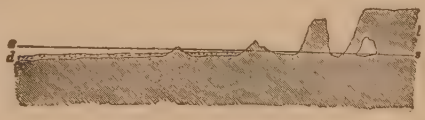
Geology (jē-ol'ō-ji; Gr. *gē*, the earth, *logos*, a discourse) is the science which treats of the history of the earth, as ascertained by the study of its exterior or crust, investigating the successive changes which have taken place in the rock-masses composing it, their relations, structure and origin, and discussing also the main features of the animal and vegetable life of the past as bearing on the earth's history. The present condition and conformation of the earth is the result of vast changes in the past and of agencies working through

Section of River Terraces, showing Successive Levels of Flood Plains.

immense periods of time, and the same or similar agencies may still be seen at work producing similar changes. Thus rocks, both aqueous and igneous, are still being formed. The former receive their name from owing their origin mainly to water, which acts both chemically and mechanically on the crust of the earth, in wearing down rocks and soils and carrying the débris often to considerable distances. The sediments thus carried to sea, or into lakes and estuaries, are spread abroad in the water, and form stratified deposits, which in course of time solidify into rock. With sufficient time all land would thus be eventually degraded beneath the sea, were it not that the loss is compensated by disturbance and elevation of land always slowly taking place over great portions of the continents and islands of the world. Such disturbances have produced strange phenomena among the stratified rocks, which may be contorted, tilted up, dislocated, or otherwise changed in their original arrangement. The strata resulting from aqueous deposits are consolidated (petrified) chiefly by pressure and chemical decomposition and recomposition. Some formations are many thousands of feet in thickness. Contraction of the crust of the earth due to radiation of the heat of the earth into space has also had immense effects, the result being that over broad areas rocky masses have been contorted and compressed to a great degree, and mountain ranges upheaved.

Igneous rocks also form a considerable portion of the visible crust of the earth, though much smaller in amount than those of sedimentary origin. Some of the igneous rocks consist of beds of volcanic ashes, others of old lavas, others of masses of matter which were introduced in a melted state from below among the strata. Granite is the most important and widely-spread of the igneous rocks, and is generally regarded as the fundamental rock of the earth's crust. Rocks that have been melted are known to be igneous by their structure, and also by the effects they have produced on the strata with which they are associated. Shales, sandstones, etc., are often hardened, bleached, and even vitrified at the points of junction with greenstone, basaltic, and felspathic dykes, or old lava beds, and the same kind of alteration takes place on a greater scale when large masses of igneous rocks have been intruded on the strata.

That the rocks which form the crust of the earth had the same general origin with the igneous rocks and sedimentary strata now forming has been well established, and that there is a regular succession of strata from the older to the newer, the oldest being normally lowermost, the newest uppermost, is also well ascertained. A corresponding succession in regard to the animal and vegetable life of former ages has also been proved by the fossils that accompany the successive strata. This *superposition of strata* and *the succession of life in time* are two cardinal doctrines in geology. Observation and experiment alike establish the doctrine of superposition. Thus at the edges of the strata on which London stands the rocks known as the Woolwich and Reading beds are *seen* to lie on the chalk. Far within these edges well-sinkers are aware that often after sinking several hundred feet through the London clay the chalk is reached. In like manner proceeding westward across the middle of England, it is found that



Section of Submarine Plain.

l, Land cut into caves, tunnels, sea-stacks, reefs, and skerries by the waves, and reduced to a platform below the level of the sea (*s s*) on which the gravel, sand, and mud (*d*) produced by the waste of the coast may accumulate.

the Chalk rests on the Greensands, the Greensands on the Upper Oolites, the Lower Oolites on the Lias, the Lias on the New Red marl, and so on through lower members of the geological series of English rocks. Similar conditions

may be found in all other countries, the superposition of strata being widely evident. Each great group of rocks consists of several subdivisions called *formations*, and each group, and even to a considerable extent minor subdivision, is characterized by the presence of distinct assemblages of organic remains. The successive appearance of such remains, which constitutes *the succession of life in time*, was the great discovery of Wm. Smith, made more than a century ago. The main rock-systems into which the earth's crust is divided, and which are based on the characteristics of the organic remains contained in them, are shown in the following table in ascending order:

Life Periods.	Rock Systems.	
Post-Tertiary or Quaternary	Recent—Alluvium, Peat, etc.	
	Pleistocene.	
Tertiary or Kainozoic	Pliocene.	
	Miocene.	
	Oligocene.	
	Eocene.	
Secondary or Mesozoic	Cretaceous.	
	Jurassic	Oolitic.
		Liassic.
	Triassic.	
Primary or Palæozoic	Permian.	
	Carboniferous.	
	Devonian.	
	Silurian.	
	Cambrian.	
Archæan, Laurentian, or Eozoic	Fundamental Gneiss.	

Igneus rocks also are associated in different localities with the systems named in the foregoing table.

In the small area of Great Britain a more complete series of rocks exists than in any other part of the earth's surface of equal dimensions—so far as is known. The greater part of the European series is, indeed, nearly complete in England and Wales alone; and since the days of William Smith, the British rocks, from this early and complete study, have generally been the types to which formations in other parts of the world were referred.

Archæan, Pre-Cambrian, or *Laurentian Rocks.*—The *Laurentian* are the oldest known of the sedimentary rocks. They are *metamorphic* (that is, changed from their original structure), and mostly gneissic in character, and were for long classed as granitic and igneous rocks till their true nature was shown by Sir William Logan. They occupy vast tracts of country in Labrador and Canada, consisting there of two divisions, *Lower* and *Upper Laurentian.* The gneiss of the lower division is interstratified with several thick banks of crystalline limestone, in one of which was found a structure believed by Dawson, Carpenter, and others to be a foraminifer and called *Eozoon Canadense.* It is now, however, generally believed to be a mineral product, In the Outer Hebrides and on the west coast of the North Highlands, rocks occur of highly metamorphic gneiss, which are probably of Laurentian age. The term *Pre-Cambrian* or *Archæan* is now applied to these rocks in the British area; they crop out also in North and South Wales, in the Malvern Hills, and in Charnwood Forest in Leicestershire. No fossils have yet been observed in these rocks. The *Huronian Rocks* of North America are possibly intermediate in age between the Laurentian and the rocks next mentioned.

Cambrian.—These rocks come next in succession to the Laurentian strata. The term Cambrian has been used differently by different geologists. The purple grits and slates to which the term Cambrian was restricted by Murchison form the greater part of the group of hills in Wales that lie east of Cardigan Bay; they are also well seen in Carnarvon-

Normal Faults.

shire, where the celebrated slate quarries of Penrhyn and Llanberis lie in Cambrian strata. Parallel strata, known by the same name, are found abundantly in other parts of the earth. Many of the beds are destitute of fossils, but these occur in certain localities down to the lowest beds of the system, and include brachiopods, trilobites, and other low organisms.

The *Silurian Rocks* were first worked out in detail in South Wales and the bordering counties by Sir Roderick Murchison, and an account of them published in the year 1839 in his *Silurian System.* They are divided by geologists into the *Lower* and *Upper Silurian.* The former comprises in ascending order the *Lingula beds* (so named from a characteristic fossil shell), the *Tremadoc slate,* the *Llandeilo flags,* and the *Caradoc* or *Bala beds.* The Lingula flags (*Potsdam sandstone* of the United States) rest conformably on and in fact pass by gradations into the Cambrian rocks. Above them lie the Llandeilo flags of North Wales, named from the town of Llandeilo in Carmarthenshire, where they

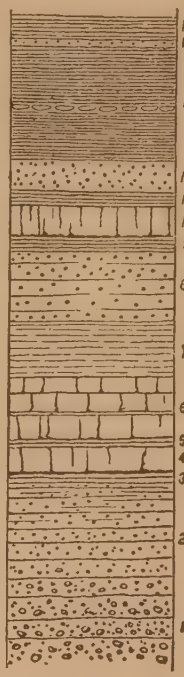
occur in a typical form. Above and passing into these lie the Caradoc or Bala beds (*Trenton limestone* of United States). The most characteristic fossils of the Lower Silurian are the crustaceans known as trilobites, of which more than 200 species are known to belong to these rocks. Other fossils include hydrozoa, corals, echinodermata, numerous mollusca (brachiopods in particular, also lamellibranchiates, pteropods, gasteropods, cephalopods or cuttlefishes). No fishes nor any other vertebrate animals have yet been found in the Lower Silurian rocks. In the United States the Upper Silurian include the *Oriskany* and *Niagara* beds; in Britain occur a number of successive beds, from the *Pentamerus* to the *Ludlow*. All the formations are in general terms fossiliferous, repeating the organisms of the Cambrian, and also having in their upper strata the earliest indications of the fishes, consisting of small teeth and scales of placoid fishes.

Old Red Sandstone and Devonian.—The *Old Red Sandstone* first received that name in contradistinction to the *New Red Sandstone*, the former occurring below and the latter above the Carboniferous strata. Where the uppermost Silurian strata join the Old Red Sandstone there is a gradual passage between them. A broad belt of Old Red Sandstone crosses Scotland in a north-east direction between the Firth of Clyde and Montrose and Stonehaven, and it occurs elsewhere in that country and in various parts of England. The Scotch beds were first carefully studied by Hugh Miller, who discovered in them remarkable fish forms (the Pterichthys, Cephalaspis, etc.). The absence of marine shells and the nature of the fossil fishes of the Old Red Sandstone of Great Britain indicate that the formation was deposited not in the sea, but in a great fresh-water lake, or in a series of lakes, for the nearest living analogues of many of the fish are the Polypterus of the African rivers, the Ceratodus of Australia, and in less degree the Lepidosteus of North America. In Canada, the sandstones of Gaspé are of Devonian age, as is found by their containing Cephalaspis.

The name *Devonian* has been given to a series of rocks in Devonshire bearing fossils intermediate in character between those of the Upper Silurian and those of the Carboniferous limestone, and which are considered as the equivalents of the Old Red Sandstone of the west of England and of Scotland. The terms Devonian and Old Red Sandstone are thus generally considered equivalent in point of time, and, though first found and studied in Britain, are now known in many parts of the world. These rocks have been divided into *Lower*, *Middle*, and *Upper Devonian*. The lower beds chiefly consist of slaty beds and green and purple sandstones, with brachiopods. The middle group, which includes the Plymouth limestone, contains numerous corals. The Upper Devonian group contains land plants (Stigmaria, etc., and many shells), some of which are identical with those found in the Lower Carboniferous limestone-shales.

Carboniferous Rocks.—In the south and middle of England, and in Ireland, the *Carboniferous Rocks*, so named on account of the masses of coal contained in them, consist chiefly of limestone at the base and Coal-measures above.

The Coal-measure beds consist of alternations of sandstone, shale, fire-clay or underclay, coal, and ironstone. Underneath each bed of coal is a bed of underclay with the roots known as Stigmariæ, forming the soil in which the plants were rooted, by the decay of which, passing into peat, material was supplied for the production of coal. These coal-bearing beds are numerous in England, where they have long been worked, their abundant product being the basis of the great industrial progress of that country. In the Carboniferous rocks more than 500



Section showing Alternation of Beds.

15. Shale. 14. Seam of sandstone. 13. Shale with septarian nodules. 12. Sandstone. 11. Mudstone. 10. Limestone. 9. Clay. 8. Sandstones. 7. Sandy clays. 6. Limestone with parting of shale. 5. Shale. 4. Limestone. 3. Shale with cement-stone passing down into sandstone (2), which graduates into fine conglomerate (1).

species of fossil plants have been named, a large proportion of which are ferns, including some tree-ferns. The remaining chief plants are gigantic club mosses known as Calamites, Lepidodendron, and Sigillaria. Coniferous trees also occur, as do the wings and wing-cases of beetles and other insects, spiders, etc., and large amphibian land animals. In the purely marine series of rocks, of which the Carboniferous limestone forms the most important part, we find corals, very numerous crinoids, brachiopods also exceedingly numerous, and Lamellibranchiate molluscs. Many cuttlefishes and numerous fish also occur, the latter including great sharks; trilobites are scarce. The greatest known development of the Carboniferous strata is in the United States, in which the beds spread over a vast area of country, and yield an enormous output of coal. They occur also widely in China (though as yet little worked), and to some extent in all the continents and many of the countries of the earth.

PASSAGE OF GRANITE UPWARDS INTO SOIL.
a, solid blocks. *b*, rounded blocks. *c*, soil.

The *Permian* series succeeds the Carboniferous rocks, and were long considered as part of the New Red Sandstone. They were named *Permian* by Sir Roderick Murchison, from the government of Perm, in European Russia, where they largely occur. They consist of sandstone, red marl, etc., and contain a bed of the magnesian limestone. The fossils of the Permian group are generically and specifically few in number, but as a whole their affinities and grouping are decidedly Palæozoic. All the Permian fish have heterocercal tails, like the majority of the Palæozoic genera, in which the vertebral column is prolonged into the upper lobe of the tail, whereas in the modern fishes the vertebral column is not prolonged into either lobe.

The *New Red Sandstone*, or *Trias*, succeeds the Permian strata. It has received the name of *Trias* from the fact that when fully developed, as in Germany, it consists of the three great divisions of *Keuper*, *Muschelkalk*, and *Bunter Sandstein*. Few old genera and no species pass thus far upwards. The majority of the genera of Brachiopoda disappear, and the whole grouping of the fossils now ceases to be Palæozoic, and assumes a character common to the Secondary rocks. In its greatest development in England, the Bunter series (of soft red sandstone and quartz conglomerate) is about 3000 feet thick. The Muschelkalk may be well seen, among other places, near Gotha, and at Eisenach in Thuringia. It is a gray, shelly limestone, rich in fossil mollusca. No fossils are known in the Bunter Sandstones of England, though a few are found in equivalent strata in Europe. The upper red marl (Upper Trias) varies from 500 to 2000 feet in thickness, and contains, besides other fossils, footprints and bones of reptiles. In the United States the Triassic rocks of Virginia and North Carolina contain workable beds of coal. The red sandstone of the Connecticut Valley is of Bunter age. Above the Keuper strata occur a series of beds called the *Rhætic beds*, from similar strata in the Rhætic Alps, and appear to be intermediate between the red marl and the next series of strata. At the bases of the Rhætic beds have been found minute teeth of the earliest known mammal (*Microlestes Rhæticus*), a small insect-eating marsupial.

The *Lias* and *Oolite* series succeed the New Red and Rhætic beds. On the continent of Europe the Lias and Oolite together are termed *Jurassic*, because in a typical form they are largely developed in the range of the Jura. The Lower Lias clay and lime, as a whole, is rich in the remains of life. These include crinoids, decapod crustaceans, Terebratulæ, and other Brachiopoda, and numerous Lamellibranchiate molluscs. Cephalopoda, such as ammonites and belemnites, are specially numerous, together with species of nautilus. Fish are numerous and there appear in the Lower Lias a great number of remarkable reptiles, some of gigantic size, as the Ichthyosaurus, the Plesiosaurus, and the well-known Pterodactyle. The *Marlstone* series, or *Middle Lias*, which is generally a brown, ferruginous, soft, sandy rock, is rich in many forms of ammonite and belemnite, etc. From the *Upper Lias clay* much alum shale, as also the well-known Whitby jet, is obtained. It is a stiff, unfertile, dark-blue clay.

The *Oolitic* strata as a whole stretch across England from southwest to northwest, or from Portland Bill to North Yorkshire. The *Inferior Oolite*, the lowest member of the Lower Oolite, chiefly consists of beds of yellow limestone. Much of the limestone is oolitic, that is to say, it is formed of small concretionary bodies, like the roe of a fish, cemented to-

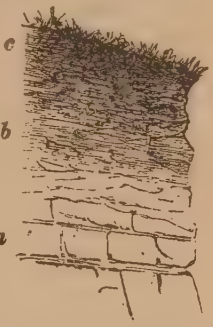
gether in a calcareous matrix. Among fossils of the Bath or Great Oolite, which succeed that mentioned, are reptiles of the genera Teleosaurus and Megalosaurus, together with the gigantic Cetеosaurus (or whale-lizard), probably about 50 feet in length. During this part of the Oolitic epoch, while in the south of England the strata were exclusively marine, in the middle and north they were to a great extent estuarine, fresh-water, and terrestrial.

The *Middle* and *Upper Oolite* succeed, and are locally divided into many beds, an important section of the *Upper* being the Portland limestone, found especially in the isle of Portland, and used as a favorite building stone. The celebrated Portland stone has been employed in many public buildings, including St. Paul's. Like those of all the other Oolite formations it is cream-colored, and generally fossiliferous. Oolitic rocks, known by the name of *Jurassic*, almost identical with those of Britain, occur largely in France; and the mountain range of the Jura, dividing France and Switzerland, is chiefly formed of Liassic and Oolitic rocks. From thence they range interruptedly northwards and eastwards, covering a large part of the plains of European Russia, and extending along the Himalayas.

As regards the fossil remains of the Lias and Oolite, a remarkable feature is the vast development of Cephalopoda, especially of the genera *Belemnites*, *Nautilus*, *Ammonites*, and *Ancyloceras*. There are also many genera and species of fishes, chiefly in the Lias, and the genera and species of reptiles are so numerous that this life-period has been sometimes called 'the age of reptiles.' The plants include ferns, horsetails, conifers, cycads, etc. Viewed as a whole, the Liassic and Oolitic strata seem to have been deposited in warm seas round groups of islands formed of the older Palæozoic rocks of Europe. Succeeding them is a series of transition strata, known as the *Purbeck* and *Wealden*, developed in several localities and leading upward to the cretaceous rocks.

The *Cretaceous Formation* is divided into a lower and an upper series of strata, comprising in England the *Lower Greensand*, the *Gault*, and the *Upper Greensand*. It derives its name from the *Chalk*, a sort of soft, white limestone, which occurs in thick beds in Europe and Asia, covering an enormous area. On examination with the microscope, much of it is found to consist of the shells of Foraminifera, Diatomacea, spiculæ and other remains of sponges, Polyzoa, and shells, highly comminuted. Somewhat similar deposits are now forming in the open Atlantic at great depths, chiefly of Foraminifera of the genus *Globigerina*. Plants are comparatively few in the Chalk, but animal remains are very numerous. More than eighty species of fish are known; various great reptile forms, as the Mosasaurus, Plesiosaurus, and Ichthyosaurus, Pterodactyles, etc. In America the Cretaceous epoch presents some extraordinary reptilian forms of immense size, also various birds. The sands and marls of New Jersey, are of this age, and similar beds occupy extensive tracts in the western regions; but there is no true white chalk in America.

Of the *Tertiary* strata the *Eocene Rocks* form the lowest division. The strata are divided into the Lower Eocene and the Upper Eocene or *Oligocene*. The Lower Eocene rocks lie sometimes on upper beds of Chalk, and sometimes on beds lower in the series. They are therefore highly *unconformable*, and in this we have the reason of the complete difference in the species of the Cretaceous and Eocene rocks, for great continental areas of Chalk were upheaved above the sea, and remained as dry land for a period of time so long that when they were again submerged the life of Cretaceous times had died out, and other forms appeared. Remains occur of birds allied to the vulture and kingfisher, and a small swimming-bird with tooth-like serratures on the bill; turtles and river tortoises are numerous. In the Upper Eocene or Oligocene various Ungulate mammalia are found, such as the Anoplotherium, Palæotherium, a kind of river-hog, tapirs, etc. In France, in the Paris basin, the Eocene strata are largely developed. The Wahsatch, Bridger and Uinta beds of North America are of Eocene age.



Passage of Sandstone Upwards into Soil.
a, solid sandstone.
b, broken-up sandstone.
c, earthy layer.

The *Miocene Rocks* are well represented by strata (mostly of fresh-water origin) in Central France (Auvergne, etc.) and Switzerland. Over many parts of Europe, Asia, and America there are other Miocene strata, each more or less possessing peculiarities. They show a

marked progression in mammalian forms over those of the Eocene, showing a distinct and decided evolution.

The *Pliocene* strata contain many fossils indicative of still greater progress and approaching somewhat closely to the animal forms of modern date. They include remains of species of mastodon, elephant, hippopotamus, and horse, as also of the common otter, deer, etc., of a character showing that the dawn of the recent period is near at hand.

The *Post-tertiary* or *Quaternary* Epoch is that immediately before the period in which we are now (the *recent*). It is characterized especially by various glacial phenomena, and in particular by numerous evidences of a glacial period, when the northern hemisphere was subjected to a climate of the utmost rigor, and much of it buried under beds of glacier ice, probably as thick as that of the north of Greenland at the present day. (See

Helladotherium Duvernoyi.
An extinct member of the giraffe family.

Glaciers.) It is believed that subsequently a slow withdrawal of the glaciers took place, leaving behind them beds of sand, gravel, and clay, full of boulders and ice-scratched stones, intermingled with shells of Arctic or semi-arctic type sometimes lying at heights of from 800 to 1200 and 1400 feet above the present sea-level. These phenomena are more or less universal over great part of Northern Europe and North America. Among Post-tertiary plants there are Scotch firs, pines, yews, oaks, alders. The mammalian remains include those of elephants, rhinoceroses, hippopotamus, the common horse, bison, aurochs, red deer, roe-deer, Irish elk, Machairodus (a tiger?), etc. Many of these animal remains are found in the celebrated *bone caves*, several notable examples of which have been investigated. (See *Cave.*) In these have been found not only such remains as those of the cave bear, cave hyæna, fox, wolf, cat, lion, reindeer, Irish elk, bison, rhinoceros, elephant, etc., but also the works of man, such as flint implements, and in some localities human skulls and other bones associated with the above-named mammalia. When the ice had fully passed away the *recent* period began, distinguished by the presence of man and of the lower animals which still exist, and marked by few and minor geological changes.

Geometrical Mean, the second of the terms of a geometrical progression containing three terms. The geometrical mean of two numbers is equal to the square root of their product. See next article.

Geometrical Progression, a series of numbers which increase or decrease by equal ratios; as, 2, 4, 8. 16, or 16, 8, 4, 2.

Geometry (jē-om'e-tri; Greek *gē*, earth, and *metron*, measure), as its name implies, was primarily the mathematical science which has for its object the measurement of portions of the earth's surface; but now geometry may be termed the science which treats of the properties and relations of definite portions of space, such as surfaces, volumes, angles, lines. The relation between the parts of the same figure may be of two kinds,—of position or of magnitude; for example, two points in a straight line, four points on the same circle, two straight lines perpendicular to one another, a straight line tangent to a circle, are relations of position. On the other hand, the proportionality of homologous lines of two similar figures, the equality of the square constructed on the hypotenuse of a right-angled triangle to the sum of the squares constructed on the sides containing the right angle, that of the volumes of two pyramids on equal bases and of the same height, are relations of dimension. But the relations of position govern the relations of dimension, and *vice versa;* that is, the one set of relations depend upon the other. Thus it is because a triangle is rectangular that the square constructed on one of its sides is equivalent to the sum of the squares constructed on the other two, and, *vice versa*, that relation between the magnitudes of the squares on the three sides depends on the triangle being right-angled. The geometer may draw indifferently from the study of a figure either the knowledge of the relations of position or that of the relations of dimension, on the condition that he knows how to apply relations of the one kind to those of the other; and the principal aim of geometry is to examine into the connection between the

relations of magnitude and those of position.

Geometry may be conveniently divided into several principal sections—elementary geomentry, practical geometry, analytical geometry, infinitesimal geometry, etc. *Elementary geometry* comprehends two parts—plane geometry, the object of which is the study of the simplest figures formed on a plane by straight lines and circles; and solid geometry or geometry of three dimensions, which treats of straight lines and planes considered in any relative position whatever, of figures terminated by planes, of the cylinder, of the cone, and of the sphere. *Analytical geometry*, either plane or solid, makes use of the method of coördinates introduced by Descartes and primarily applied to curves. In ancient times, though curves were studied and the principal properties of conic sections known, still no connection existed between these curves, nor was there any means of establishing one, so that the study of one was of no value to that of another. The first question in introducing the analytical method was then to fix upon some means which should serve to construct every curve by successive points as numerous and as closely brought together as is necessary in order to lay down the curve. Now the position of a point in a plane may be determined by two intersecting perpendiculars drawn from two fixed lines —the coördinate axes—at right angles to each other. An equation may then be found which states the relation between the coördinates of any point, that is, its distance from the two coördinate axes. (See *Coördinates.*) The study of the curves will thus be simply the study of their equations. In this way a typical equation for a curve in a certain system may be got, so that if at another time the curve is represented under another definition in investigating its equation in the same system of coördinates, particularized so as to simplify as much as possible the calculations, it will suffice to compare the particular equation with the general one to verify the identity of the curve, to give it its name, and to know all the properties of it which have been studied previously. In a similar way the analytical geometry of solid bodies is based on the fact that the position of any point in space can be determined by reference to three intersecting planes. *Infinitesimal geometry* is simply a continuation of the analytical geometry of Descartes, of which it may indeed be said it forms a part: the difference consists simply in the nature of the questions which, as they involve the measurement of magnitudes, the incessantly variable elements of which cannot be summed up by finite parts, require the use of the infinitesimal calculus. *Descriptive geometry* consists in the application of geometrical rules to the representation of the figures and the various relations of the forms of bodies according to certain conventional methods. In the descriptive geometry the situation of points in space is represented by their orthographical projections, on two planes at right angles to each other called the *planes of projection.*

History.—The origin of geometry is assigned by an ancient tradition to Egypt, but the history of the science, as far as it is known, commences in Greece with Thales (639-548 B.C.). To him is attributed the discovery of the properties of triangles. His disciple, Pythagoras (born about 580), founded a celebrated school in Italy where geometry was as highly honored as philosophy. He discovered the theorem of the square of the hypotenuse, thus completing, so to speak, the geometry of polygons. He was also the first to show that the circle contains a greater area than any plane figure having the same perimeter, and that the sphere contains the greatest volume bounded by a given surface. After him Anaxagoras, Hippocrates of Chios, Theodorus of Cyrene, and Archytas of Tarentum cultivated the science and have left names connected with various problems, but the next great development of the science is due to Plato and his disciples, who laid the foundation of the analytical method and developed the fundamental principles of geometrical *loci.* Euclid, who belonged to the famous school of Alexandria, and flourished about 285 B.C., has the merit of collecting and systematizing all the more important problems and theorems worked out by his predecessors, besides adding many new ones of his own. He also wrote various other mathematical works, a book of *Data*, a treatise on *Porisms*, etc., most of which have been lost. It is in his *Elements of Geometry*, which are still the favorite text-book, that the method of proof known as the *reductio ad absurdum* is first found. After Euclid came Archimedes (287-212 B.C.). Among his achievements are the determination of the ratio of the diameter of a circle to its circumference, and the investigation of the areas of the circle and parabola and other problems much more difficult than any previously attacked. Archimedes had completed that branch, the object of which is the comparison with each other of magnitudes of the same nature; Apol-

lonius (247 B.C.) made an analogous progress in that which treats specially of the properties of figures. His eight books of *Conics*, in which he considers these curves in the oblique cone, which had not been done until that time, contain almost all their interesting properties, those which relate to their foci, tangents, asymptotes, or diameters, and to their involutes. Eratosthenes, Nicomedes, the inventor of the conchoid; Hipparchus, who made some progress in spherical trigonometry Menelaus (80 A.D.); Ptolemy (125 A.D.), Pappus (390), and Proclus (440), continued the fame of the Alexandrine school. Diophantus introduced methods of an algebraic kind, and was the model on which the Arabic geometers, and Leonard of Pisa, Cardan, and finally Vieta formed themselves. He is thus the connecting link between the ancient and modern geometricians. After the sack of Alexandria and the burning of its library the science was confined to India and to the Arabic school of commentators, and it was not till the middle of the sixteenth century that geometry revived in Europe with Vieta (1540-1603), who introduced the use of algebraic symbols for the solution of geometrical problems. Trigonometry owes to him most of the elegant formulæ which now constitute it. In the writings of Kepler (1571-1631) we find the first applications among the moderns of the method of Exhaustions of Archimedes freed from the difficulties which had encumbered the geometry of the Greeks; and to Cavalieri (d. 1647) belongs the honor of an entirely new method for quadratures and cubatures. Descartes (1586-1650), developed Vieta's discoveries, created the science of analytical geometry, which greatly extended the domain of geometrical science. Fermat (1570-1633) and Barrow (1630-77) with their methods of tangents and of maximums; Huyghens (1629-95), with the theory of involutes, were on the road to the differential calculus, as Roberval, Pascal, and Wallis with their processes of summation were to the integral calculus. Newton (1642-1727) and the brothers Bernouilli (1654-1705, 1667-1748) made important contributions, such as the theorem on the generation of curves of the third order and the method of isoperimeters. About the beginning of the nineteenth century a decided advance was made by Monge (1746-1818) and Carnot (1753-1823). The Descriptive geometry of the former established the whole theory of projections. Carnot's first contribution to geometrical science was his principle of the *correlation of figures*, a principle which, having been farther generalized, is now known as the *principle of continuity*. His second contribution was his *theory of transversals*. On these inventions is founded *modern geometry*, which has revolutionized the science, and has given us generalized conceptions previously undreamed of. Amongst the later geometricians who have contributed to extend the methods and domain of the science we may mention Poncelet for his theory of reciprocal polars, Chasles for his treatise on porisms, etc.; Sir William Rowan Hamilton for his invention of quaternions, an entirely new method; Cayley and Sylvester for their application of generalized geometrical methods to space of more dimensions than three.

Geophagism (jē-of'a-jism), or DIRT-EATING, the practice of eating some kind of earthy matter, clay, chalk, etc., common amongst uncivilized peoples, such as the South American Ottamacs, the Indians of the Hudson Bay country, the West Indian blacks, the negroes in some of the United States of America, and others. In some cases it is probably used to allay hunger, but it is also practised where the supply of food is sufficient. Amongst chlorotic young women a similarly depraved appetite is not uncommon. Uncinariasis (hookworm disease) is sometimes produced by it, the hookworms getting into the blood through the intestines.

George, DUKE OF SAXONY (*the Bearded*), born in 1471; died in 1539; was the son of Albert the Brave, the founder of the Albertine line of Saxony, and succeeded in 1500 to the hereditary dominions of the Albertine house. Later on he became involved in the turmoils of the Reformation period. He was not at first wholly hostile to reform, but thought that it could be better effected by means of papal edicts than by the revolt of Luther. Accordingly he became embittered by the uncompromising tone of Luther's later writings, and endeavored to suppress the Reformation within his dominions by violent measures. These, however, were unsuccessful, and in 1539, on the accession of his brother Henry, who was a Protestant, the Reformation was successfully introduced into the dominions of the Albertine house of Saxony.

George, ST., a saint venerated both in the eastern and western churches, and the patron saint of England. He was canonized in 494 or 496 by Pope Gelasius. His origin is very obscure, one of many legends representing him as a prince of Cappadocia mar-

tyred by Diocletian. Gibbon has sought to identify this legendary saint with the notorious and turbulent Arian heretic George of Cappadocia, who was slain in 361 in a rising of the populace who had been infuriated by his oppression and his violence against pagans and orthodox. But the most eminent scholars, both Roman Catholic and Protestant, are of opinion that the veneration of St. George has been traced up to so early a period as to make it very improbable that a notorious Arian could have been foisted on the Catholic Church as a saint and martyr. The killing of a dragon that was about to swallow a maiden is a legendary feat attributed to him. He was adopted by the Genoese as their patron saint, and in 1222 the Council of Oxford ordered that his day (the 23d of April) should be observed as a national holiday in England; in 1350 he was made the patron of the order of the Garter by Edward III.

George, Order of St. The following are the principal of the numerous orders which have been founded in honor of St. George:—(1) A military order instituted in Russia in 1769 by the Empress Catharine II as a reward of military achievements. It consists of four classes, to which a fifth, intended for non-commissioned officers and privates, was added in 1807. (2) An order instituted in Bavaria by the Emperor Charles VII (Charles Albert) in 1729, and recognized by King Louis II in 1871. Since the reorganization the order, which had previously been a mere decoration for the nobility, has devoted itself to such services as the care of the wounded on battlefields, etc. (3) An order instituted by Ernest Augustus of Hanover in 1839. (4) A Sicilian military order, instituted by Joseph Napoleon, 24th February, 1808, and remodeled by King Ferdinand IV in 1819. (5) The name under which the order of the Garter was first instituted in England. See *Garter (Order of the)*.

George, St., one of the Bermudas. It is about 3 miles long and half a mile broad, is fortified, and contains a port of the same name, which is a British military station.

George, The, a badge exhibiting the figure of St. George encountering the dragon, worn pendent from the collar by the Knights of the Garter. See *Garter*.

George I, of Great Britain, and (George Louis), King Elector of Hanover, was the son of the Elector Ernest Augustus, by Sophia, daughter of Frederick, Elector Palatine, and granddaughter to James I. He was born May 28, 1660, and in 1682 was married to Sophia Dorothea of Zell, whom, in 1694, on account of a suspected intrigue with Count Königsmark, he caused to be imprisoned and kept in confinement for the rest of her life. In 1698 he succeeded his father as elector. He commanded the imperial army in 1707 during the war of the Spanish succession; and ascended the throne of Great Britain on the death of Queen Anne in 1714. Amongst the notable events of his reign were the rising of the Scottish Jacobites (1715-16); the Triple and Quadruple Alliances against Spain (1717 and 1718); and the failure of the South Sea Company (1720). He died in 1727. The private character of George I was bad, but he showed much good sense and prudence in government, especially of his German dominions. By Sophia Dorothea he had a son, George, afterwards George II of England, and a daughter, Sophia, the mother of Frederick the Great.

George II (George Augustus), King of Great Britain, son of George I, was born October 30, 1683. He married in 1705 Wilhelmina Carolina of Brandenburg-Anspach. In 1708, then only electoral prince of Hanover, he distinguished himself at Oudenarde under Marlborough. In 1727 he succeeded his father on the English throne, but inherited to the full the predilection of George I for Hanover. His reign is notable for the great events with which it is filled, and for the number of men great in art, letters, war, and diplomacy which then adorned England. The war of the Austrian succession, in which George II himself took part at Dettingen, the Jacobite rebellion of 1745, the conquest of Canada, and the growth of the British empire in India are amongst the chief events of his reign. George II died suddenly October 25, 1760. He was a prince of very moderate abilities, regardless of science or literature; of obstinate temper and vicious habits; but honest and open in his disposition.

George III, George William Frederick, King of Great Britain, born in 1738, was the eldest son of Frederick, Prince of Wales, by the Princess Augusta of Saxe-Gotha, and succeeded his grandfather, George II, in 1760. In the following year he married the Princess Charlotte Sophia of Mecklenburg-Strelitz. The sixty years of his reign were filled with great events, amongst which are the Wilkes controversy, the American Revolution, 1775-83; the French Revolution, 1789, and the

Irish rebellion, 1798, etc. George III, while conscientious, was mentally obtuse, and his narrow patriotism, his obstinate prejudices, and blind partialities were even more hurtful to British interests than the indifference of his predecessors had been. His tastes and amusements were plain and practical, literature and the fine arts receiving but a small share of his attention. His private life was very exemplary. In 1810 the king's mind, which had already given way several times, finally broke down, and from that time to his death on January 29, 1820, his biography is a blank.

George IV (GEORGE FREDERICK AUGUSTUS), King of Great Britain, son of George III and the Princess Charlotte of Mecklenburg-Strelitz, born in 1762; died June 26, 1830. His dissipated life, his extravagance, his supposed marriage with a Catholic, Mrs. Fitzherbert, alienated from him the affection of his father and the esteem of the nation. In 1795 he married the Princess Caroline of Brunswick, from whom he soon separated, and who was afterwards tried for adultery in 1820 and acquitted. In 1811 George became regent, and, on the death of George III in 1820, succeeded as king.

George V (FREDERICK ERNEST ALBERT), King of Great Britain, was born at Marlborough House, London, June 3, 1865. He was the second son of Edward, Prince of Wales, afterwards Edward VII. His elder brother, Duke of Clarence, died in 1892, leaving him heir to the throne, to which he succeeded on the death of his father, King Edward, May 6, 1910. The career of the new king as a prince was largely in the navy, which he entered at the age of 12, and continued until he reached the throne, passing through the several grades from midshipman in 1880 to rear-admiral, 1901, vice-admiral, 1903, and admiral, 1907. This progress in the navy was not made without regard to merit, as the sailor prince showed himself brave, ready and efficient on more than one critical occasion. In 1893 he married the Princess Victoria Mary, daughter of the Duke of Teck, and has six children, the oldest, Edward Albert, succeeding him as Prince of Wales. The sailor prince became Duke of Cornwall when his father took the throne, and soon after started on a tour of the colonies, opening the first parliament of the Commonwealth of Australia in 1901. In the fall of 1905 he went to India, and in 1908 visited Canada, to attend the celebration at Quebec, but did not visit the United States, as his father had done in a similar trip to Canada George V differs from his father in several particulars. He does not share Edward's love of sports, is less approachable and more intellectual, and is devoted to home life. As a monarch, he has shown ability and decision, especially in his determination not to take the coronation oath in its old form of offensive allusion to the doctrines of his Catholic and non-conforming subjects. In 1911 he visited India, a step which no former British king had taken. The purpose of his visit was to be crowned emperor of this distant realm of the empire.

George I, 'King of the Hellenes,' was born at Copenhagen Dec. 24, 1845, second son of the king of Denmark. In 1863 he was elected king by the Greek National Assembly. In 1867 he married the Princess Olga, a niece of the Russian czar. His conduct as a constitutional monarch was correct and regular, and he won the popular sympathies by the efforts he made on behalf of the expansion of Greek nationality. He was fatally shot by an anarchist in Salonika, March 18, 1913, and was succeeded by his son, the crown prince Constantine, born August 2, 1868.

George, HENRY, political economist, was born at Philadelphia, Pennsylvania, in 1839. He wrote a number of works, the most famous being *Progress and Poverty*, upon which was based the doctrine maintained by the 'Single Tax' advocates, namely, that all land should belong to the state and pay a tax sufficient to meet all the expenses of the government. He was the author of several other works. He was twice nominated for mayor of New York, in September, 1886, and October, 1897; in the former he was defeated and he died suddenly during the heat of his canvass of the latter, October 29, 1897.

George, LAKE, a lake in New York state, between Warren and Washington Counties, south of Lake Champlain, into which it discharges at Ticonderoga. It is 36 miles long, and from ¾ mile to 4 miles in width. It is surrounded by lofty hills wooded to the top, has richly wooded shores, and many picturesque islands. Caldwell, Bolton, and other places on its banks are favorite resorts, and in summer large numbers of tourists are attracted by the beauties of its scenery. Here was fought a severe battle in 1755, in which the French and Indians were defeated by the English, and it was the scene of several other warlike events. Fort Ticonderoga lay between it and Lake Champlain.

George Junior Republic, a juvenile

GEORGIA
Scale of Miles
0 10 20 30 40 50 60
Longitude West from Greenwich
Atlanta
Athens
Augusta
Macon
Columbus
Savannah
Brunswick
Thomasville
Cartersville
Griffin
Americus
Dalton
Waycross
Fernandina
Jacksonville
Live Oak
Lake City
Madison
Tallahassee
Quincy
St. Marks
Perry
Drifton
Greenville
Monticello
Jasper
White Springs
Baldwin
Callahan
Hilliard
Folkston
Kingsland
St. Marys
Yulee
Toledo
Moniac
Fargo
Alexandrville
Lakepark
Valdosta
Boston
Pavo
Nashville
Ocilla
Fitzgerald
Abbeville
Eastman
Hawkinsville
Dublin
Milledgeville
Sandersville
Louisville
Waynesboro
Girard
Augusta
Aiken
Edgefield
Greenwood
Abbeville
Anderson
Greenville
Spartanburg
Gaffney
Rock Hill
Chester
Union
Newberry
Columbia
Camden
Florence
Darlington
Bennettsville
Dillon
Marion
Conway
Georgetown
Charleston
Summerville
Walterboro
Beaufort
Hardeeville
Ridgeway
Batesburg
McCormick
Abbeville
Laurens
Clinton
Greenville
Pickens
Walhalla
Seneca
Toccoa
Clayton
Rabun Gap
Hiawassee
Young Harris
Blairsville
Blue Ridge
Ellijay
Cleveland
Dahlonega
Gainesville
Jefferson
Commerce
Danielsville
Carnesville
Lavonia
Hartwell
Royston
Bowersville
Elberton
Washington
Lincolnton
Thomson
Grovetown
Harlem
Appling
Wrens
Louisville
Waynesboro
Girard
Augusta
Hephzibah
Warrenton
Norwood
Barnett
Sparta
Eatonton
Madison
Monroe
Loganville
Lawrenceville
Duluth
Norcross
Buford
Cumming
Dawsonville
Jasper
Canton
Woodstock
Kennesaw
Marietta
Smyrna
Austell
Douglasville
Lithia Springs
Powder Springs
Villa Rica
Carrollton
Bremen
Buchanan
Tallapoosa
Temple
Hogansville
Lagrange
Greenville
Gabbettville
Pine Mountain
Manchester
Woodbury
Thomaston
Barnesville
Molena
Concord
Zebulon
Griffin
Milner
Luthersville
Moreland
Newnan
Senoia
Fayetteville
Peachtree City
Palmetto
Fairburn
Jonesboro
Lovejoy
Hampton
Stockbridge
Conyers
Covington
Oxford
Social Circle
Rutledge
Madison
Eatonton
Milledgeville
Sandersville
Tennille
Wrightsville
Dublin
Hawkinsville
Abbeville
Fitzgerald
Ocilla
Nashville
Pavo
Thomasville
Cairo
Whigham
Bainbridge
Climax
Ochlocknee
Sale City
Meigs
Ashburn
Sycamore
Tifton
Ty Ty
Arabi
Rebecca
Pitts
Cordele
Vienna
Richwood
Leslie
Smithville
Parrott
Dawson
Leesburg
Albany
Sasser
Edison
Blakely
Bainbridge
Donalsonville
Saffold
Jakin
Colquitt
Boykin
Camilla
Pelham
Stubbs
Vada
Murphy
Chastain
Barney
Morven
Dixie
Hahira
Naylor
Dupont
Homerville
Hybert
Waluwright
Racepond
Manor
Ruskin
Maude
Winokur
Waverly
Whites
Satilla R.
Schlatterville
Waynesville
Bladen
Hortense
Nahunta
Waresboro
Patterson
Blackshear
Alma
Bristol
Jesup
Doctortown
Odessa
Offerman
Ridgeville
Evans
Darien
Sou. Br.
Simmons Mills
Brunswick
Glenmore
Waycross
Douglas
Broxton
Wheaton
Surrency
Medders
Bushnell
Lumber City
Hazlehurst
Graham
Baxley
Ludowici
Darien Jc.
Altamaha R.
Ohoopee R.
Ohoopee
Collins
Bellville
Daisy
Glennville
Lambert
Hinesville
Midway
Mcintosh
Savannah
Pembroke
Rembert
Guyton
Brooklet
Quinlan
Hagan
Register
Metter
Hurryhill
Stillmore
Graymont
Summit
Swainsboro
Garfield
Rocky Ford
Dover
Oliver
Egypt
Millen
Sylvania
Perkins
Idlewood
Fairfax
Denmark
Harlem
Warrenton
Thomson
Grovetown
Appling
Wrens
Louisville
Waynesboro
Girard
Augusta
Aiken
Perry
Fort Valley
Marshallville
Montezuma
Oglethorpe
Ellaville
Andersonville
Pinehurst

community founded in 1895 near Ithaca, New York, by William R. George, as an experiment in the training of outlaw children of the slums in their future duties as American citizens. The children govern the community themselves under a system of municipal administration, and the experiment has been so successful that similar communities have been founded in other localities.

George-noble, a gold coin of the time of Henry VIII of the value of 6*s.* 8*d.* sterling ($1.60). It is so called from bearing on the reverse the figure of St. George killing the dragon.

George's Channel, St., the arm of the sea which separates Ireland from Wales south of the Irish Sea. From Holyhead and Dublin on the north to St. David's Head and Carnsore Point it extends about 100 miles, with a breadth varying from 50 to 70 miles. Its depth in the middle varies from 40 to 70 fathoms. The bottom is chiefly sand and gravel.

Georgetown (jorj'town), formerly a city of the District of Columbia, on the left bank of the Potomac, near the city of Washington; now a part of Washington, with which it was incorporated in 1878. It is beautifully situated on a range of hills, and abounds with villas and country seats. It is a terminus of the Chesapeake & Ohio Canal. Pop. (1920) 17,083.

Georgetown, county seat of Scott Co., Kentucky, 12 miles N. of Lexington. It is the seat of Georgetown College (Baptist; founded 1829; students, 400). Pop. (1920) 3903.

Georgetown, county seat of Georgetown Co., South Carolina, a port of entry at head of Winyah Bay, at mouth of Waccamaw River. It has turpentine distilleries, saw mills, and ships rice, rosin, etc. Pop. (1920) 4579.

Georgetown, or Demerara, the capital of British Guiana, at the mouth of the Demerara. It is neatly built, consisting of broad streets at right angles, with canals in the middle, and lofty wooden houses, often with luxuriant gardens attached. The harbor has a good anchorage. Chief exports are sugar, rum, gold, and timber. Pop. 54,000.

Georgetown, or Penang, Straits Settlements. See *Penang.*

Georgetown University, an educational institution in Washington, D. C., under the management of the Jesuit Order, founded in 1789. Students, 2000.

George Washington University, at Washington, D. C., founded in 1821 as Columbian College, by Baptists. In 1873 it was incorporated as Columbian University. The name was changed to George Washington University in 1904. Students, 3800; instructors, 275.

Georgia (jor'ji-a; *Sakartvelo*), a country in Transcaucasia, between the Black Sea and the Caspian. Formerly constituting the Russian government of Tiflis, it was declared a republic in 1918, following the collapse of Russia in the European war. The newly established republic is bounded on the N. by the Caucasus; E. by Azerbaijan; S. and S. W. by Armenia and Turkey. Area, 35,500 sq. miles; pop. about 3,175,000. The capital is Tiflis. The natives are a fine-looking race, the Georgian women, like the Circassians, being celebrated for their beauty. The Georgian language, together with that of the Mingrelians, Lazes, and other Caucasian peoples, seems, according to the latest researches, to form a perfectly distinct linguistic family. It possesses a not unimportant literature, commencing with the introduction of Christianity into the country. The history of the Georgians first becomes trustworthy about the time of Alexander the Great, to whom they became subject. About B.C. 324 they gained their independence under Pharnavas. They became Christianized towards the end of the fourth century. After yielding for a time to the supremacy of the Arabian caliphs Georgia regained its independence towards the end of the tenth century, which it retained till 1799, when Heraclius, successor of George XI, formally ceded his dominions to the Russian emperor Paul.

Georgia, one of the Southern United States, is bounded N. by Tennessee and North Carolina, E. by South Carolina and the Atlantic, S. by Florida, and W. by Alabama; length, north to south, 320 miles; breadth, 255 miles; area, 59,265 sq. miles (about the same as England and Wales). The coast is bordered by a chain of islands, separated from the mainland by narrow lagoons or sounds. On them the famous sea-island cotton is raised. The land is low towards the coast, beginning as a salt marsh, grown over with tall reeds, continuing next as swampy rice plantations and then as 'pine barrens' about 60 to 90 miles inland, whence it gradually rises as a sandy district, interspersed with fertile tracts, till it reaches the lower falls of the Savannah, Ogechee, Oconee, and other rivers. Here the hilly and finally mountainous region called the Upper Country begins, a fertile and salu-

brious region extending north and west till it rises into the Appalachian mountain chain, the highest peak in the state being 4821 feet. Along the coast and near the lower courses of the streams are rich alluvial districts, interspersed with meadows, which are suited to rice culture. In the southwestern part of the State is a large area which has long been justly celebrated for its cotton product, Georgia being next to Texas in its yield of cotton, averaging about 2,000,000 bales annually. Of the rivers, the Chattahoochee, which flows under the name of the Appalachicola into the Gulf of Mexico, is navigable for steamers for 300 miles; the Savannah is navigable for steamers part of the year for 250 miles; and the Altamaha and its affluents are navigable for small vessels 300 miles upwards. The climate is mild and pleasant, but unwholesome in the low parts of the country during the months of July, August, and September. The soil in many parts is very rich. Cotton and corn are the leading plantation products, and rice, with some sugar-cane, are staple crops in the lowlands. In addition, tobacco, the sweet potato, and other crops are cultivated with success. The fruits, which include peaches, apples, melons, oranges, bananas, etc., are of the finest and large quantities of them are shipped to the North. The chief minerals are granite, marble, iron ore, limestone, clay, asbestos, manganese, bauxite, some coal, gold, silver, lead, etc. Georgia ranks second (Vermont, first) in the production of granite in the United States. The pine forests furnish large supplies of lumber, rosin and turpentine. Of manufactures, the most important is the production of cotton goods, and of cotton-seed oil. Atlanta is the seat of the legislature and largest town; the other principal towns are Savannah (the chief seaport), Augusta, Macon, and Columbus.

A charter for the foundation of a colony in the territory now called Georgia was obtained in 1732 by General Oglethorpe from George II, after whom the state was named, his purpose being to colonize it with debtors taken from the London prisons. Georgia was one of the thirteen original states. In 1788 it adopted the constitution of the United States by a unanimous vote. In January, 1861, Georgia seceded with the Confederates, took an active part in the Civil war, and was conquered by a Federal army under General Sherman (1864-5) and restored to the Union. The history of Georgia in the last few years has been one of material progress. The National Expositions held at Atlanta in 1881 and 1895 were of great benefit to agricultural and manufacturing interests. Pop. (1910) 2,609,121; (1920) 2,895,832.

Georgia, GULF OF, a large gulf of the North Pacific Ocean, between the continent of North America and Vancouver's Island; about 120 miles in length from north to south; the breadth varies greatly in its different parts, from 6 miles to 20. It communicates with the ocean on the north by Queen Charlotte Sound, and on the south by the Strait of Juan de Fuca.

Georgia, SOUTH, an island in the South Atlantic, lat. at its north point 53° 57′ S.; lon. 38° 13′ W. It is 90 miles long, and has high and rocky coasts, inaccessible from ice during a great part of the year. It abounds with seals and sea-fowls.

Georgia Bark (*Pinckneya pubens*), a small tree of the Southern United States closely resembling the cinchona or Peruvian bark, and belonging to the natural order Cinchonaceæ. The corolla is tubular; the stamens five, with a single style; and the capsule contains two cells and numerous seeds. The wood is soft and unfit for use in the arts. The inner bark is extremely bitter, and is employed with success in intermittent fevers.

Georgian Bay, formerly called Lake Manitoulin, the northeastern part of Lake Huron, partly separated from the main body of the lake by the peninsula of Cabot's Head and the island of Great Manitoulin. It is about 120 miles long and 50 broad.

Georgievsk (gā-or′gē-efsk), a garrison town in the province of Terek, North Caucasia, Russia. It has a trade in silk and leather. Pop. 14,000.

Georgium Sidus, the name given by Herschel to the planet which he discovered March 13, 1781; now known as Uranus.

Georgswalde (gē-orgs-väl′dä), a town in Bohemia, Austria, on the Saxony frontier. It has linen manufacturers. Pop. (1910) 8836.

Geotropism (jē-ot′ru-pizm), in botany, a disposition or tendency to turn or incline towards the earth, as the characteristic commonly exhibited in a young plant, when deprived of the counteracting influence of light, of directing its growth towards the earth.

Geotrupidæ (jē-o-trū′pi-dē), a family of burrowing lamellicorn beetles. They inhabit temperate climates, and are useful in removing disgusting substances. When alarmed they feign death. The *Geotrūpes ster-*

corarius, or watchman-beetle of Britain, is the type of the family.

Gepidæ (jēp'i-dē) a people of Germanic origin, first read of as settled about the mouth of the Vistula in the third century. Before the fifth century they had migrated to the Lower Danube, where they were subjugated by the Huns; but, revolting against Attila's son, they recovered their freedom and established themselves in Dacia. There their power grew so great that they levied tribute from the Byzantine emperors down to Justinian's days. In the end of the fifth century a powerful enemy arose against them in the Ostrogoths; and after them came the Longobards, who, in alliance with the Avars, inflicted a crushing defeat on the Gepidæ in 566. A part submitted to the Avars, while a part accompanied the Longobards to Italy, and finally became assimilated.

Gera (gā'rà), the chief town of the principality of Reuss-Schleiz, in Germany, on the right bank of the Elster, 35 miles S. S. W. of Leipzig. It has manufactures of woolen, linen, cotton, and other goods. Pop. 47,455.

Gerace (je-rä'chā), a town of S. Italy, province of Reggio di Calábria, 36 miles N. E. of Reggio. The cathedral, once a handsome structure, was ruined by the earthquake of 1783. Pop. 10,752.

Gerando. See *De Gerando.*

Geraniaceæ (je-ra-ni-ā'se-ē), a nat. order of exogenous plants, the distinguishing character of which is to have a fruit composed of five capsules or cases, connected with as many flat styles, consolidated round a long, conical beak, giving some of the species the name of stork's-bill and crane's-bill. These plants are usually astringent and odoriferous, and many of them have beautiful flowers, especially those of the genus *Pelargonium*, natives of the Cape of Good Hope. The species are mostly herbaceous plants. A few of them have edible tubers. See next article.

Geranium (je-rā'ni-um), the typical genus of the order Geraniaceæ (which see), popular name crane's-bill. They have usually palmately divided leaves and regular flowers with ten stamens and five carpels. Some thirteen species are wild in Europe, of which the *G. robertianum* or herb-robert is the most common. An American species, *G. maculātum*, from its astringency called 'alum-root,' is used medicinally as a gargle and otherwise. The so-called geraniums of our gardens belong to the genus *Pelargonium*. Cultivation has produced many varieties, which from their beauty are great favorites.

Gérard (zhā-rär'), François Pascal, Baron, a French historical and portrait painter, born at Rome in 1770; went to Paris (1786), and studied under David. In 1795 he exhibited his first notable painting, *Belisarius*. He was much patronized by Napoleon, for whom he painted the battle of Austerlitz, and was made a baron by Louis XVIII, after completing his large painting of the *Entrance of Henry IV into Paris*. Amongst his portraits the most famous are those of Talleyrand, Talma, Louis Philippe, Madame Récamier, Mlle. Mars, etc. He died in 1837.

Gérard, Jean Ignace Isidore, a French caricaturist and book illustrator, generally known under the pseudonym of Grandville, was born at Nancy in 1803, died at Paris in 1847. He went to Paris in 1824, and after some minor works acquired great popularity in 1828 by his *Metamorphoses du Jour*, a representation under the guise of animal heads of human foibles and weaknesses. Later on he became a contributor to *Le Charivari* and an illustrator of the works of Béranger, La Fontaine, *Gulliver's Travels*, *Robinson Crusoe*, etc.

Gérard, Maurice Etienne, Count, marshal and peer of France, born 1773. He served as a soldier during the republic and the empire, distinguishing himself at Austerlitz and other battles. In 1813 he was made a general of division and a count. He distinguished himself in the battle of Ligny, and at Waterloo acted under Grouchy. He took an active part in the revolution of 1830; became war minister and marshal; commanded the troops which reduced Antwerp in 1832; became prime minister 1834; commander of the national guard 1838; died at Paris in 1852.

Gérard de Nerval, the pseudonym of Gérard Labrunie, a French man of letters, born in Paris in 1808. His earlier productions were poetic, *Elégies nationales* and *Poésies diverses*. As an adherent of the Romantic school he set himself to translate Goethe's *Faust*, and performed it in a manner which the old poet himself pronounced a marvel of style. Amongst his best works are his short tales and sketches, *Voyages en Orient*, *Contes et Facéties*, *La Bohème Galante*, etc. He became insane and committed suicide in Paris, 1855.

Gerasa (je-rä'sà), Gerash, or Djerash, a ruined town in Syria, 80 miles S. S. W. of the town of Damascus. It was several times de-

stroyed and rebuilt. The ruins, comprising ancient walls, gateways, a forum, baths, theaters, and temples, are very extensive.

Gerba, or JERBA (jĕr'ba), an island in the Gulf of Cabes, off the coast of Tunis. It is about 20 miles long and 14 broad. The surface is level and fertile, and occupied by a population of 45,000, mostly Berbers.

Gerbillus (jer-bil'us), a genus of small burrowing rodents (the gerbils) of the family Muridæ (mice). They have a long tail, which is tufted at the end. There are several species, found in the sandy parts of Africa and Asia. The Egyptian gerbil (*G. Ægyptiacus*), which inhabits Egypt around the pyramids, is the type. It is about the size of a mouse and of a clear yellow color.

Gerfalcon (jer'faw-kn). See *Falcon.*

Gerhard (ger'hârt), EDUARD, a German archæologist, born in 1795; died in 1867. Having traveled in Italy, he devoted himself to archæology, and in 1829 took part in founding the Archæological Institute at Rome. Returning to Germany in 1837, he became archæologist at the Royal Museum at Berlin, and afterwards professor at the university. Among his numerous works are the following: *Antike Bildwerke* (with 140 plates); *Auserlesene Griechische Vasenbilder* (330 plates); *Etruskische und Campanische Vasenbilder. Griechische Mythologie*, etc.

Gerhardt, KARL, an American sculptor, born at Boston in 1853. His works of sculpture include busts of General Grant, Henry Ward Beecher and Samuel L. Clemens and statues of John Fitch, Nathan Hale, Israel Putnam and many others.

Gerhardt (ger'hârt), KARL FRIEDRICH, a German chemist, born in 1816. He studied under Liebig at Giessen, went to Paris in 1838, was appointed professor of chemistry at Montpellier, returned to Paris in 1842 to pursue his investigations; went in 1855 to Strasburg as professor in chemistry and pharmacy, but died soon after, in 1856. Gerhardt is the author of several works, amongst which the most celebrated is his valuable *Traité de Chimie Organique.* The methods he originated have had a great influence on modern chemistry.

Gerhardt, PAUL, the greatest of German hymn-writers, born in 1607. He studied theology, became pastor of Mittenwalde in 1651, and afterwards at Berlin. A strict Lutheran, he opposed energetically all attempts to unite the Lutheran and Reformed Churches, and was removed from his church in 1666 in consequence of his refusal to subscribe to the edict of 16th Sept., 1664, prohibiting mutual insults or offensive language between the churches. In 1668 he was made archdeacon in Lübben, where he died in 1676. His excellent book of hymns appeared at Berlin in 1667 (*Geistliche Andachten*). Many particular hymns have found English translators and appreciation.

Gericault (zhā-rē-kō), JEAN LOUIS THÉODORE ANDRÉ, a French painter, born at Rouen in 1791; went to Paris in 1806 and studied under Charles Vernet and Guérin. His first pictures (the *Chasseur Officer* and the *Wounded Cuirassier*) were exhibited in 1812 and 1814. In 1817 he visited Italy, returned to Paris in 1819, and painted the *Raft of the Medusa* (a well-known shipwreck of the time), a work of much power, which won immediate popularity. He died at Paris in 1824.

Gerizim (jĕr-ī'zim), MOUNT. See *Ebal.*

Germ (jĕrm), in physiology, the earliest form under which any organism appears; that is, the rudimentary or embryonic form of an organism. The name is also given to certain minute organisms which give rise to disease. See *Germ Theory.*

Germain (zher-maṇ), ST., the name of a number of places in France, among which is St. Germain-en-Laye, a town in the department of Seine-et-Oise, about 6 miles north from Versailles and 11 miles W. N. W. from Paris, on the left bank of the Seine. The most remarkable building is the royal palace, commenced by Charles V in 1370, and embellished by several of his successors, especially Francis I and Louis XIV. It was used as a prison during the revolution, afterwards as a high school for calvary officers, and was ultimately restored in 1862 by Napoleon III, who established in it a museum of Gallo-Roman antiquities. The forest of St. Germain is one of the finest in France, extending over 10,000 acres. Pop. 17,297.

German Catholics, a religious sect which sprung up in Germany about the close of the year 1844. The immediate cause of its formation was the exhibition by Arnoldi, bishop of Trèves, of the holy coat preserved in the cathedral of that city, accompanied by a promise of plenary indulgence to whoever should make a pilgrimage to Trèves to worship it. The announcement caused a general feeling of astonishment in Germany, and two

priests, Johannes Ronge of Silesia and Johann Czerski of Posen, whose independent views had already caused the deposition of the one and the secession of the other, led a secession movement, appealing to the lower grades of clergy to unite in founding a national German church independent of the pope. A number of congregations were formed, especially in Leipzig, under the celebrated Robert Blum, and in Magdeburg, under the teacher Kote. Two creeds were drawn up for the new church, the *Confession of Schneidemühl*, by Czerski, which, though somewhat Roman Catholic, rejected indulgences, purgatory, auricular confession, etc., and the *Confession of Breslau*, drawn up by Ronge. The latter, which was far more heterodox, was substantially adopted by the Council which met at Leipzig, March 22, 1845. The organization was almost the same as that of the Presbyterian Dissenting churches of Scotland. Each congregation was to choose its own pastor and elders. For a time the new church had a great success. Many Protestants joined the body, which, by the end of 1845, numbered nearly 300 congregations. Difficulties soon arose, however. The majority of the German governments began to use repressive measures. More fatal were internal dissensions, one party, headed by Czerski, clinging to the traditions and doctrines of the Roman Catholic Church, the other, headed by Ronge, tending to mix up democratic and socialistic principles with their creed. After the rise of 'Old Catholicism' the movement lost all importance.

German Confederation. See *Germany.*

German Evangelical Protestant Church (United States) is liberal in doctrinal belief, having no confession of faith. Its ministers are associated in district unions. It has a membership of about 35,000.

German Evangelical Synod of North America. This body accepts the symbolical books of the Lutheran and Reformed Churches, representing in the United States the State Church of Prussia, which is a union of the Lutheran and Reformed bodies. It celebrated, Oct. 12, 1890, the semicentennial anniversary of its organization in the United States. The number of members is about 300,000.

Germanicus (jer-man'i-kus), CÆSAR, a distinguished Roman, son of Nero Claudius Drusus and the younger Antonia, a niece of Augustus, was born B.C. 15. He was adopted by Tiberius, his parental uncle, and married Agrippina, the granddaughter of Augustus. When Augustus died (in A.D. 14) Germanicus was invited by the rebellious legions on the Rhine to assume the sovereignty, but refused, and quelled the revolt. He then crossed the Rhine, surprised and defeated the Marsi with great slaughter. Next year (A.D. 15), a campaign against the Catti and the Germans, led by Arminius, resulted in a series of victories. The following year he again made his way into Germany, defeated the Cherusci twice, and made an incursion into the country of the Marsi. Tiberius now became jealous of the glory of Germanicus, called him home under pretense of granting him a triumph, then, to get rid of him, sent him into the East to compose the disturbances in Armenia and Cappadocia. This he performed in A.D. 18, visited Egypt the following year and died on his return to Syria (A.D. 19) under some suspicion of having been poisoned by Cn. Piso, the governor of Syria.

Germanium (jer-man'i-um), a metallic element discovered by Dr. Winckler in 1885. Its symbol is Ge; atomic weight 72.3; has a melting point of about 1650° F., a perfect metallic luster and a grayish-white color. Fifteen years before its discovery its existence had been prophesied by Mendelejeff to fill a gap in his periodic table between silicon and tin.

German Ocean. See *North Sea.*

German Paste, the name given to a kind of paste made for feeding cage-birds, such as canaries, larks, nightingales, etc. The following is one of various recipes: one pound of pea-meal, half a pound of blanched sweet almonds, two ounces of fresh butter, two ounces of moist sugar, fifteen grains of hay saffron. Mix and beat well with a little water, pass through a colander, then expose to the air till dry.

German Sarsaparilla, a name given to the roots or rhizomes of *Carex arenaria*, *C. disticha*, and *C. hirta*, from their being occasionally used in Germany as a substitute for sarsaparilla.

German Silver, NICKEL SILVER, or PACKFONG, is an alloy of copper, nickel, and zinc in different proportions, amongst which the following may be mentioned. Spoons and forks are made from 2 parts copper, 1 nickel, 1 zinc; knife and fork handles from 5 copper, 2

nickel, 2 zinc, a mixture closely resembling alloyed silver; addition of lead produces an alloy which appears well fitted for casts, and for making candlesticks, etc.; iron or steel, on the other hand, makes the alloy whiter, harder, and more brittle. German silver is harder than true silver, and takes a splendid, high polish. It melts at a red heat, the zinc being volatilized in the open air. It is attacked by the strong acids, and it is also affected by common organic acids, such as vinegar, and by some saline solutions.

German Tinder, or AMADOU, is prepared from the *Bolētus fomentarius*, a fungus growing on the oak, birch, and some other trees, or from the *Bolētus igniarius* found on the willow, cherry, plum, and other trees. The fungus is removed with a sharp knife, washed, boiled in a strong solution of saltpeter, beaten with a mallet, and dried. In surgery it is sometimes used to stop local bleeding.

Germantown (jer'man-toun), a northern section of Philadelphia, pleasantly situated on high ground, about 6 miles north of the city hall. It was settled by Germans about 1683 immediately after the founding of Philadelphia, and here Washington attacked the British occupying Philadelphia, October 4, 1777, but was defeated. It is largely settled by business men of the city and contains many elegant residences.

Germany (jer'ma-ni; Latin, *Germania;* German, *Deutschland;* French, *Allemagne*), the name given collectively to the states in Central Europe which constitute the German Empire. The limits of Germany have varied greatly at different times; and at present there are large numbers of Germans in race and language who are not included within the boundaries of the empire, many being natives of Austria and Switzerland. As one of the Teutonic peoples, the Germans are akin by race to the Dutch, English and Scandinavian peoples. The capital of Germany is Berlin; Weimar was the temporary capital on the overthrow of the monarchy, 1918; other large cities are Hamburg, Breslau, Munich, Dresden, Leipzig, Cologne. The following table shows the component parts of the German Empire as it existed prior to the European war of 1914-18. By the peace of Versailles, 1919 (see *Treaty*), Germany lost Alsace-Lorraine (to France) and parts of Prussia (to Poland), and all her colonies. With the abdication of William II. in 1918, Germany became a republic. Pop. 59,000,000.

KINGDOMS.	Area in sq. miles.	Population.
1. Prussia	134,463	37,293,324
2. Bavaria	29,282	6,524,273
3. Würtemberg	7,528	2,302,179
4. Saxony	5,787	4,508,601
IMPERIAL TERRITORY.		
5. Alsace-Lorraine	5,668	1,814,564
GRAND-DUCHIES.		
6. Baden	5,821	2,010,728
7. Hesse	2,965	1,209,175
8. Mecklenburg-Schwerin	5,135	625,145
9. Mecklenburg-Strelitz	1,131	103,451
10. Oldenburg	2,479	438,856
11. Saxe-Weimar	1,388	388,095
DUCHIES.		
12. Brunswick	1,424	485,958
13. Saxe-Meiningen	953	268,916
14. Saxe-Coburg and Gotha	755	242,432
15. Saxe-Altenburg	511	206,508
16. Anhalt	906	328,029
PRINCIPALITIES.		
17. Waldeck	433	59,127
18. Lippe	469	143,577
19. Schaumburg-Lippe	131	44,992
20. Schwarzburg-Rudolstadt	363	96,825
21. Schwarzburg-Sondershausen	333	85,152
22. Reuss (elder line)	122	70,603
23. Reuss (younger line)	319	144,584
FORMER FREE TOWNS.		
24. Bremen	99	263,440
25. Hamburg	158	874,878
26. Lübeck	115	105,857
	208,738	60,641,278

Physical Features.—Germany, as regards its surface, may be divided into three different regions. Farthest south is the Alpine region along the southern frontier, comprising parts of Bavaria, Würtemberg, and Baden lying next to Austria and Switzerland. North of this the Suabian-Bavarian plateau extends to the mountain region of Central Germany, where the chain known as the Fichtelgebirge is continued east by the Erzgebirge and the Riesengebirge, forming the boundary next Austria; west by the Thüringerwald, Rhöngebirge, and Spessart; farther north lie the Harz Mountains. The great plain in the north extends without interruption to the German Ocean and the Baltic. Germany is remarkably well watered. Its central mountain region and plateau form part of the great watershed of Europe. The Danube proceeds across it in an eastern direction, and the Rhine, though it neither rises nor terminates within Ger

GERMANY
SHOWING NEW BOUNDARIES
Scale of Miles
0 20 40 60 80 100 120 140
Railroads
Capitals
Sovereignty to be decided by plebescite
Size of type indicates relative importance of places
C.S. HAMMOND & CO., N.Y.
NORTH SEA
BALTIC SEA
SWEDEN
DENMARK
COPENHAGEN
HELGOLAND
FRIESIAN ISLANDS
NETHERLANDS
HAGUE
Amsterdam
Rotterdam
BELGIUM
BRUSSELS
Antwerp
Namur
Liege
FRANCE
Metz
Nancy
Strasbourg
Besançon
SWITZERLAND
Basel
Lake Constance
Hamburg
Bremen
Hanover
Munster
Dortmund
Essen
Cologne
Frankfort
Mainz
Wiesbaden
Darmstadt
Mannheim
Karlsruhe
Stuttgart
Nuremberg
Munich
Augsburg
Regensburg
Leipzig
Dresden
Chemnitz
Halle
Magdeburg
Berlin
Stettin
Rostock
Lubeck
Kiel
Danzig
Konigsberg
Posen
Breslau
Cracow
Warsaw
Lodz
Prague
Pilsen
Brunn
Vienna
Linz
Salzburg
Innsbruck
Bruck
Wr. Neustadt
HUNGARY
AUSTRIA
BOHEMIA
BAVARIA
WURTTEMBERG
BADEN
THURINGIA
HESSE
WESTPHALIA
HANOVER
MECKLENBURG
POMERANIA
BRANDENBURG
SAXONY
PRUSSIA
EAST PRUSSIA
POLAND
RHENISH PRUSSIA
PALATINATE
LUXEMBURG
SCHLESWIG HOLSTEIN
FUNEN
SEELAND
MOEN
FALSTER
RUGEN
BORNHOLM
Gulf of Danzig
FREE CITY DANZIG
Memel
Tilsit
Insterburg
Eydtkuhnen
Pillau
Elbing
Marienburg
Allenstein
Deutsch-Eylau
Graudenz
Thorn
Alexandrovo
Plock
Bromberg
Gnesen
Kalisz
Ostrowo
Kempen
Liegnitz
Glogau
Jarotschin
Kottbus
Guben
Lissa
Frankfort
Kustrin
Stargard
Schneidemuhl
Kreuz
Landsberg
Angermunde
Neu Ruppin
Neu Strelitz
Schwerin
Stendal
Uelzen
Luneburg
Altona
Emden
Groningen
Leeuwarden
Zwolle
Zuider Zee
Meppen
Osnabruck
Minden
Bielefeld
Arnheim
Breda
Elberfeld
Dusseldorf
Bonn
Coblenz
Luxembourg
Sedan
Thionville
Verdun
Sarrebourg
Avricourt
Epinal
Colmar
Mulhausen
Belfort
Langres
Freiburg
Lindau
Kempten
Rosenheim
Hohenzollern
Reutlingen
Ulm
Ingolstadt
Landshut
Passau
Wels
Steyr
Hohenlinden
Ischl
Krems
Gmund
Znaim
Budweis
Pilsen
Tabor
Iglau
Olmutz
Prerau
Troppau
Oderberg
Ratibor
Bielitz
Trzebinia
Sosnovitz
Konigshutte
Oppeln
Schweidnitz
Neisse
Hohenfriedeberg
Gorlitz
Hochkirch
Reichenberg
Zwickau
Plauen
Hof
Coburg
Meiningen
Fulda
Giessen
Wiesbaden
Schweinfurt
Bamberg
Wurzburg
Baireuth
Ansbach
Schwandorf
Kolin
Pardubitz
Koniggratz
Tepitz
Carlsbad
Eger
Kaschau
Kosmark
Neu Sandec
Tarnov
Krakow
Kielce
Sandomir
Radom
Lublin
Ivangorod
Skierniewice
Siedlce
Ostrolenka
Mlava
Suwalki
Grajevo
Lyck
Rossieny
Niemen R.
Pregel R.
Vistula R.
Warta R.
Bug R.
Oder R.
Spree R.
Elbe R.
Weser R.
Ems R.
Rhine R.
Moselle R.
Danube R.
Inn R.
Isar R.
Lahn R.
Main R.
Neckar R.
Saar R.
Lake Constance

many, flows within it for the greater part of its course. After these come the Elbe, the Oder, Weser, Main, Neckar, Mosel, Ems, and Eider—all of which are navigable. Germany possesses much and varied mineral riches, the most important minerals being bituminous and brown coal, iron, zinc, lead, and salt. Tin, quicksilver, antimony, sulphur, marble, kaolin, asbestos, freestone, etc., occur in various localities. Germany is likewise extremely rich in mineral waters, especially in the southern parts. Though the country extends over 8½° of latitude, its mean annual temperature is remarkably uniform. This is owing mainly to the different elevations of the surface, the low plains of the north having a higher, while the hills and plateaux of the south have a lower temperature than their latitudes might seem to indicate. The mildest climate is enjoyed by the valleys of the Rhine and the Main.

Agricultural Products, Etc.—These are varied and numerous. With the exception of the loftier mountain districts, where the surface is fit only for pasture, the growth of all the ordinary cereals is universal. Potatoes, hemp, and flax also form most important crops, and in many parts the sugar-beet is cultivated on an extensive scale; also tobacco and hops. Wine is produced in many districts. The cultivation of the vine diminishes in importance from southwest to northeast, but is carried on to some extent even in the Prussian provinces of Saxony, Brandenburg, and Posen. Great quantities of other fruits are produced, principally the apple, pear, plum, and cherry. The forests are of great extent and value, particularly in the mountain districts. The central plateau is more sparingly wooded, but the eastern part of the north plain has extensive forests. This plain is largely sandy, but has been made to yield abundantly and furnishes grazing grounds for large numbers of farm animals. Among domestic animals, the horned cattle of the districts along the North Sea and the Baltic, the sheep of Saxony and Silesia, and the swine of Westphalia have long been famous. The horse, except in Schleswig-Holstein, East Prussia, Mecklenburg, and some other parts, appears to be much neglected. Game is very abundant, and includes, in addition to the smaller kinds, the boar and the wolf. Fish are numerous, both in the rivers and lakes.

Manufactures.—Linens are made in every part of Germany, but more especially in Westphalia, Silesia, Bohemia, and Saxony; woolens in the Prussian provinces of the Rhine, Saxony, Brandenburg, and Silesia, in the kingdom of Saxony, and in Alsace; the cotton manufacture constitutes the chief manufacturing industry in Alsace-Lorraine, the kingdoms of Saxony and Würtemberg, and the grand-duchy of Baden, and flourishes in Bavaria, Prussia, and other parts; the silk manufacture flourishes in the Rhine provinces and in Baden; iron manufactures are carried on in most of the states, but principally in Prussia, Alsace-Lorraine, Bavaria, and Saxony; steel is largely manufactured in the Rhine provinces. The manufactures of beet-root sugar, of leather, of metals, porcelain, glass, fancy flowers, hats, musical instruments, watches, clocks, wooden wares, including toys, etc., are likewise important; and breweries and distilleries are to be met with everywhere, beer being the favorite beverage of the Germans. Stettin is one of the principal shipbuilding centers in the world and the Krupp ironworks at Essen are unrivaled.

Commerce.—The commerce is very extensive, and is administered and guided by special laws of a union called the Zollverein or Customs Union, which embraces the whole of Germany and also the grand-duchy of Luxemburg. The exports and imports comprise a great variety of manufactured goods and raw products. The manufactures of Germany are now sent to all parts of the world, and in various places there is a strong competition between German and British goods. By far the principal seaport is Hamburg; others are Bremen and Bremerhaven, Stettin, Königsberg, Dantzig, Lübeck, etc. The total length of railways is over 37,000 English miles, of which all but about one-twelfth are state railways. By the law of Dec. 4, 1871, a uniform gold standard was introduced for the monetary system of the whole German Empire. The denominational unit is the *mark*, nearly equal to 1*s.* of British money and divided into a hundred *pfennige*. Since 1872 the French metrical system of weights and measures has been in force throughout the German Empire. See *Decimal System*.

Finances.—The revenue is derived principally from the customs duties collected throughout the Zollverein, from excise duties on beet-root sugar, salt, tobacco, and malt, and from the contributions made by each state in proportion to its population. According to the budget for year ending March 31, 1911, the revenue amounted to 2,853,781,095 marks, of which customs and excise were estimated to yield 1,441,620,000 marks. The chief item in the expenditure was on military administration, amounting to 806,740,757

marks. The estimate for the navy was 442,176,342 marks. A mark is equivalent to 23.8 cents. The debt of the empire is of no great amount.

Constitution.—The constitution of the German Empire is based upon the decree of the 16th of April, 1871, which took effect on the 4th of May following. The presidency of the empire belongs to the crown of Prussia, to which is attached the hereditary title of *Emperor of Germany.* The prerogatives of the emperor are to represent the empire in its relation to other states, to declare war if defensive, and conclude peace in name of the empire, to contract alliances, etc. The emperor has also the supreme command of the army and the navy, appoints and dismisses officials of the empire, appoints consuls, and superintends the entire consulate of the empire. The legislative authority is vested in the Bundesrath (Federal Council) and the Reichstag (Imperial Diet), the former consisting of 58 representatives of the different states of the empire, 17 from Prussia, 6 from Bavaria, 4 each from Saxony and Würtemberg, 3 each from Baden and Hesse, 1 from Saxe-Weimar, etc. The Reichstag consists of 397 deputies elected by secret voting in all the states of the empire.

Army and Navy.—Service in the army or navy is obligatory on every man in Germany from the 1st of January of the year in which he completes the twentieth year of his age to the end of his forty-second year, unless he be released altogether, or for times of peace, by the competent authorities. Seven years must be spent in the standing army or fleet (three of them in active service in the cavalry and two in the infantry, and the remainder in the reserve). The next five years are passed in the Landwehr, the members of which may be called out only twice for training during that period. All men capable of bearing arms who are not in the line, the reserve, or the Landwehr, must belong to the Landsturm, which is called out only in case of invasion of the territory of the empire. Young men above seventeen years of age who are able to pass an examination upon general subjects, and who volunteer for active service in the army, and agree to equip and maintain themselves during the time that their active service lasts, are admitted into the reserve after one year's continuous service. The peace strength of the army, in 1915, was 870,000 men, and the total war strength of trained soldiers 5,400,000. The German navy consisted, in 1915, of 100 battleships and armored cruisers, 308 torpedo boats and destroyers, and was being rapidly added to, especially with battleships of great size and power.

Religion and Education.—While the Roman Catholic Church is strong in Germany, having a membership of more than 20,000,000, the Protestant denominations are greatly in the lead, having nearly double this membership. There are also over a half million of Jews. Education is compulsory throughout Germany. Every commune or parish must support at its own cost a primary school. Every town in addition must maintain one or more middle schools, which supply a higher education than the elementary schools. Above these are *real schools* (*Realschulen*) giving a still higher education, institutions of similar standing called *gymnasiums*, giving an education in which the ancient languages form a more important element, and, above all, the universities, of which there are 21 in the country, the chief being those of Berlin, Leipzig, and Munich. The Germans as a whole are perhaps the best educated people in the world.

History.—The date of the first arrival of the Germanic or Teutonic races in Europe is unknown. At the close of the second century B. C. Germanic tribes called Cimbri and Teutones left their homes in the Danish peninsula, and descending upon Italy, were defeated by Marius at Aquæ Sextiæ (Aix in Provence) and Vercellæ in Northern Italy. The Romans did not again come in contact with the Germans till Cæsar's invasion of Gaul brought on a contest with the Suevian prince Ariovistus (58 B.C.). At that time several German tribes had crossed the Rhine and settled in the district between that river and the Vosges Mountains, while others had pushed their way through what is now Belgium. The Germans on the left bank of the Rhine were soon subjugated, and two expeditions were made by Cæsar across the Rhine. Under Augustus a systematic attempt was made to subjugate the vast and little-known region of Germania, extending between the Rhine and the Vistula, and from the Danube to the North Sea. Tiberius reduced all the tribes between the Rhine and the Elbe, but a few years later there was a revolt, in which three Roman legions under Varus were annihilated by Arminius, leader of the Cherusci, about 9 A.D. The attempt to subjugate the Germans was given up by Augustus; and Germanicus, although he avenged the defeat of Varus by a succession of campaigns, failed to recover the Roman ascendency. About this time each tribe or nation among the Germans is described as having been di-

vided into four classes: 1. The nobles, from whom the kings and chiefs of the districts were chosen. 2. The freemen, who, with the nobles, had the right to choose their residence and hold heritable property, and who formed the chief strength of the armies and voted in the popular assemblies. 3. The freedmen, a middle class between freemen and slaves, who had no landed property, but farmed the land; they were not admitted to the popular assemblies. 4. The slaves, who were entirely in the power of their masters. In religion the Germans were polytheists. Among their great gods were Woden (or Odin), Donar (Thor), Thiu (Tyr), Frigga, etc. They erected no temples and had no idols, but believed in a future life and in eternal justice.

As the aggressive force of the Roman empire abated, it continued to be more and more subject to the incursions of the Germans, who by the end of the fifth century had overrun Gaul, Italy, Spain, and part of Africa. After this Germany itself continued in a divided state till it came under the single rule of Charlemagne. (See *France.*) The history of the German Empire proper commences with the Treaty of Verdun (843 A.D.), which separated the land of the Eastern Franks under Ludwig the German from that of the Western and Central Franks. Out of Ludwig's kingdom was developed the German nationality. Charles the Fat became emperor in 881, and three years later was also elected king of the West Franks, thus again uniting under one scepter the monarchy of Charlemagne. After his deposition in 887 the two territories of the Eastern and Western Franks were again separated, the former electing Arnulf as their king. He died in 899, and was succeeded by his infant son Louis, who was proclaimed King of Lorraine in 900, assumed the title of emperor in 908, and as such is designated Louis IV. He died in 911, and the German nations chose Conrad, Count or Duke of Franconia, as his successor. He died in December, 918, of a wound received in battle with the Huns. In 919 Henry the Fowler, Duke of Saxony, was elected. He was succeeded by his son, Otto the Great in 936, who revived the empire of Charlemagne, receiving the crown of Holy Roman Empire from the pope in 962. He died in 973, and was succeeded by his son, Otto II, who had been crowned emperor by the pope in his father's lifetime. Henry II, Duke of Bavaria, surnamed the Saint, the hereditary heir of the Saxon line, was elected at Mainz, on the death of Otto in 1002, crowned emperor in Rome 1014, and died in 1024. With him ends the Saxon line of emperors.

Conrad II, surnamed the Salic, a Franconian nobleman, was chosen to succeed him. He spent several years in Italian wars, defeated the Poles, and restored Lusatia to the empire. He died in 1039. He was succeeded by his son, Henry III, who had been chosen in his lifetime, and who, the imperial power being now at its highest point, exercised more despotic authority in Germany than any of his predecessors. The fruits of his policy were lost by his son, Henry IV (1056-1106). In his reign occurred the famous quarrel with the pope regarding investitures, which ended in Henry having to humble himself before the pope at Canossa. His life was embittered by contests against rival emperors and later by the defection to the papal party of his own son Henry, by whom he was eventually deposed. Henry V (1106-25) inherited, however, the quarrel of the investitures, took Pope Paschal II prisoner, and was excommunicated by seven councils. At length the question of investiture was settled by the Concordat of Worms (1122). On his death there was a contested election and a civil war between Lothaire, Duke of Saxony, and Conrad of Hohenstaufen, in which the former was successful.

A contest was now begun between the Saxon and Hohenstaufen (Suabian) families, in which the celebrated party names Guelf and Ghibelline originated. On the death of Lothaire in 1138 Conrad III (of Hohenstaufen) was chosen to succeed him. Conrad died in 1152, and was succeeded by his nephew Frederick Barbarossa (which see). His son, Henry VI, began his reign with a war in Southern Italy. He conquered Sicily, and was crowned king of it in 1194. He died at Messina in 1197. Philip, brother of Henry, and Otto IV, were elected by rival factions in 1198. Philip, who was successful, was assassinated in 1208. Otto IV, the son of Henry the Lion, was recognized by the Diet of Frankfort in 1208 as the successor of Philip. He attempted the conquest of the Two Sicilies without success, and died in 1218. Frederick II, King of the Sicilies, was elected emperor in 1212. His life passed in contentions with the popes and the Lombard cities. He died in 1250. Conrad IV, his son, had to contend against William of Holland. He died in 1254. He was the last emperor of the house of Hohenstaufen, which became extinct on the death of his son. His successor, William of Holland, was slain in Friesland in 1256. Richard, Earl of Cornwall, and

Alfonso X, King of Castile, were chosen emperors in 1257; but the internal divisions of Germany had already deprived the office of all authority, and neither of them had any power. Until 1273 the German Empire had no real head.

Rudolph, Count of Hapsburg and Cyburg, the most powerful prince in Helvetia, was chosen emperor in 1272, and under him and his successors the status of the empire was restored. He enriched his own family by his victories over the King of Bohemia, and acquired Austria, Styria, and Carinthia as imperial fiefs for his sons Albert and Rudolph. He died in 1291. Adolphus of Nassau, his successor, was deposed in 1298 by the Diet of Mainz. Albert I, son of Rudolph, was chosen emperor the same year. He is chiefly celebrated for his wars with the Swiss as Duke of Austria, which led to the independence of Switzerland. He died in 1308, and was succeeded by Henry VII of Luxembourg, who, during nearly the whole of his reign, lived in Italy, where he died in 1313. In 1314 a double election took place, Frederick, Duke of Austria, sometimes called Frederick III, was elected along with Louis of Bavaria. On the death of Frederick in 1330 the latter became sole emperor. He died excommunicated and deposed in 1347. Charles IV, King of Bohemia, was elected in 1346. His reign is chiefly distinguished for the Golden Bull (1356) regulating the electorate. (See *Golden Bull.*) He died in 1378. Wenceslaus, his son, was deposed for his excesses in 1400. Rupert, Count Palatine, elected in 1400, possessed little authority. Sigismund, King of Hungary and Bohemia, son of Charles IV, was elected by a party in 1410. His reign is distinguished by the commencement of the Reformation in Bohemia, by the Council of Constance, and the condemnation of Huss and Jerome. He died in 1437. Albert II (V of Austria) was elected in 1438, and died in 1439. He was succeeded by Frederick III, Duke of Styria and Carinthia. He was the last emperor who was crowned in Rome. Thenceforth the German emperors were always of the house of Austria. He died in 1493. His son, Maximilian I, succeeded. During his reign the Diet of Cologne was held, which divided the estates of the empire into ten circles for the better maintenance of the public peace.

During the period here briefly reviewed the empire had undergone many changes. At the extinction of the Carlovingian dynasty Germany was divided into five nations or dukedoms—Franconia, Suabia, Bavaria, Saxony, and Lorraine. Henry the Fowler and the Ottos added the marches of Austria and Misnia; Henry the Lion and Albert of Brandenburg added Mecklenburg and Pomerania. The house of Austria added Styria, Carinthia, Carniola, and the Tyrol. But Switzerland had been lost, and the old Burgundian territories of the empire, Franche Comté, the Lyonnais, and Provence, had gone to consolidate the French monarchy under Louis XI. Bohemia and Hungary, and many of the Italian cities, especially in the north, were also connected with the empire, but the connection was more formal than real, and the circles established by the Diet of Cologne (1512) represented at that time the estates of the empire, viz.: 1. Austria, 2. Bavaria, 3. Suabia, 4. Franconia, 5. the Upper Rhine (Lorraine, Hesse, etc.), 6. the Lower Rhine, or the Electorates (Mainz, Trier, Cologne), 7. Burgundy (Netherlands), 8. Westphalia, 9. Lower Saxony (Brunswick, Lüneburg, Lauenburg, Holstein, etc.), 10. Upper Saxony (Saxony, Brandenburg, Pomerania, etc.).

The chief political machinery of the empire was connected with the diet, or administrative assembly. The exact constitution of the early German diets is not known. In the 12th century the counts of the empire became distinguished from the princes, and lost the right of voting in the diets. The election of an emperor was at first undertaken by the whole diet. In the 13th century the number of electors was restricted to seven, to which two more were afterwards added. (See *Elector.*) The diets were called by the emperor at his own pleasure, but as they had the power of granting supplies their meetings were frequent; and as their authority over the different states was partial, and their policy could only be carried out by the executive force of the emperor, they can hardly be regarded as an independent power in the state. Neither the time nor the place of meeting of the diets was at first fixed. From an early period the cities of Germany were represented in the diet. In early times they generally supported the authority of the emperor, as their interest was common with his in diminishing the power of the greater vassals. Municipalities were at first established about the reign of Frederick I, and soon began to assert their independence. The predatory habits of the nobles, besides the claims of superiority over entire cities or particular citizens asserted by the princes, involved the cities in continual warfare with the feudal nobility, and often also with their ecclesiastical superiors. The

necessity of defending their privileges compelled them to enter into leagues among themselves. Among the earliest of these combinations was the Hanseatic League, formed to resist both the oppression of rulers and the depredations of land and sea robbers. A league was formed in 1255 by more than sixty cities of the Rhine, headed by the three ecclesiastical electors, to resist the depredations of the lesser nobles. The Suabian League, formed in 1376, was of similar origin. These leagues were met by counter-associations of nobles and princes.

Maximilian, who succeeded to the empire in 1493, was succeeded in 1519 by his grandson Charles V. (See *Maximilian I, Charles V.*) The reign of Charles, the most important in the German annals and the most brilliant in the 16th century, was divided among three great conflicts—the continued struggle between France and Germany, the conflict with the encroaching Ottoman empire, and that with the Reformation. In 1556 Charles resigned the empire to his brother Ferdinand. The Council of Trent was concluded in Ferdinand's reign. He died in 1564. Then followed Maxmilian II, Rudolph II, Matthias and Ferdinand II. By this time was begun a religious war, by which Germany was devastated for thirty years, hence called the Thirty Years' war.

The invasion of Germany by Christian IV of Denmark in 1625, the Peace of Lübeck (1629), the invasion of Gustavus Adolphus (1630), the battles of Leipzig in 1631, of the Lech and Lützen in 1632, of Nördlingen in 1634, the war with France in 1635, belong to the history of the Thirty Years' war (which see). Ferdinand died in 1637, and was succeeded by his son, Ferdinand II. The latter had gained a military reputation by the battle of Nördlingen, but Banér, Bernhard of Saxe-Weimar, Torstenson, Turenne, and the Great Condé gained repeated victories over his troops. He was at length induced to enter into negotiations; and the Thirty Years' war was concluded by the Peace of Westphalia (24th October, 1648), in which the policy of France and Sweden was triumphant. The principal conditions which concerned Germany were a general amnesty and restoration of rights. France received definitely the bishoprics of Metz, Toul, and Verdun, with Breisach, Upper and Lower Alsace, and ten imperial cities in Alsace. Sweden received Rügen, and Hither Pomerania and part of Farther Pomerania, with some other territories. Greater power was given to the Protestants and the right of the princes and states to make war and alliances among themselves or with foreigners was recognized.

The emperor died in 1657. His son, Leopold I, was elected emperor in 1658. The success of Louis XIV in his invasion of Holland led to a coalition against him, in which the emperor joined (1673). The war was continued for some years, and terminated by the Peace of Nimeguen, 1679. The League of Augsburg, in which the emperor joined, led to a second protracted war with France, which was concluded by the Peace of Ryswick. In 1692 the emperor erected Hanover into an electorate, and in 1700 he permitted the Elector of Brandenburg, Frederick III, to take the title of King of Prussia. The war of the Spanish Succession, in which Great Britain, Holland, and the empire were leagued against France, was begun in 1702. To it belong the victories of Marlborough and Eugene (Blenheim, Oudenarde, Malplaquet). The Emperor Leopold died in 1705. He was succeeded by his son, Joseph I, who died in 1711. Joseph was succeeded by his brother, Charles VI. (See *Charles VI.*) The alliance against France was dissolved by the Peace of Utrecht in 1713, to which the emperor refused to accede, and was left alone against France. After a brief campaign between Prince Eugene and Villars he acceded to the Treaty of Rastadt, negotiated between these commanders, 7th March, 1714. The Spanish Netherlands, and Naples, Milan, Sardinia, and other Italian conquests were left to the emperor. Having no male heirs, Charles had promulgated in 1713 the Pragmatic Sanction, regulating the succession to his hereditary dominions in favor of his daughters in preference to those of his brother, Joseph I. He died in 1740. Charles Albert, elector of Bavaria, son-in-law of Leopold I. got himself chosen emperor (as Charles VII) in 1742. He laid claim to the hereditary possessions of the House of Austria, and entered into an alliance with France, Spain, Prussia, etc., against Maria Theresa, daughter of Charles VI. But he died in 1745, and Francis I, Grand-duke of Tuscany, the husband of Maria Theresa, was elected emperor; thus the House of Hapsburg-Lorraine, which had succeeded to the hereditary possessions of Austria, was recognized as the head of the empire. After a brief interval there took place the Seven Years' war (1756-63), in which Austria, Russia, France, and Saxony combined against Prussia, then ruled by Frederick the Great. The Peace of Hubertsburg (15th Feb., 1763) concluded the war, Prussia retaining her acquisitions. In 1765 Joseph II succeeded to

the imperial crown, becoming at the same time co-regent with his mother of the Austrian hereditary dominions. He joined with Russia and Prussia in the first partition of Poland (1772). He was succeeded by his brother Leopold, who, dying in 1792, was succeeded by his son, Francis II. He joined in 1793 in the second partition of Poland. He took the command of his army against the French in 1794, concluded the Peace of Campo Formio with Bonaparte (17th October, 1797) joined the second coalition against France in 1799, and concluded the Treaty of Lunéville (3d February, 1801); joined the third coalition in 1805, and concluded the Treaty of Presburg (26th December, 1805). In 1804 Francis took the title of hereditary Emperor of Austria, renouncing two years later that of head of the German Empire, which, indeed, had ceased to exist, owing to the conquests of Napoleon.

The States of Germany were again united by the Treaty of Vienna (1815), in a confederation called the German Confederation (der Deutsche Bund). In 1818 a general commercial league, called the Zollverein, was projected by Prussia, and was gradually joined by most of the German states, exclusive of Austria. Revolutionary outbreaks caused great disturbances in various German states in 1830 and 1848, particularly the latter. The German diet was restored in 1851 by the efforts of Prussia and Austria, who became rivals for the supremacy in the confederation. In 1866 the majority of the diet supported Austria in her dispute with Prussia respecting the disposal of the duchies of Schleswig and Holstein, whereupon Prussia withdrew from the confederation and declared it dissolved. The Seven Weeks' war between Austria and Prussia ended in the defeat of the former, the loss of her Italian possessions, and her exclusion from the German Confederation, which was re-formed by Prussia under the title of the North German Confederation. After the Franco-German war (which see), in which the South German States, as well as the North German Confederation, supported Prussia, King William of Prussia was proclaimed German Emperor at Versailles on 18th January, 1871, the new empire comprising all the German States with the exception of Austria. The parliament of the new German Empire met at Berlin on 21st March, and adopted the new constitution. William I died in 1888 and was succeeded by his son Frederick, who, however, died in the same year from a cancerous affection in his throat, and was succeeded by his son as William II. Since the unity of the empire was attained endeavors have been made to establish a colonial empire, principally in Africa, including German East and Southwest Africa and a large tract of land in the region of the French Congo, adjoining the German Kamerun protectorate.

In Polynesia, Germany acquired a portion of New Guinea, the Bismarck Archipelago, and some of the Solomon and Marshall Islands. It had also taken possession of a seaport region of northern China, with the surrounding inland section. In 1914 it took up the quarrel between Austria and Servia, fomenting a war in which the leading nations of Europe became engaged, and subsequently those of Asia and America. As regards the colonial possessions of Germany, above mentioned, it will suffice to say here that they were all lost in consequence of the war. For the conflict that followed the Servian trouble, the greatest, in several respects, in the history of the world, Germany was amply prepared, having been transformed into a military machine, without equal elsewhere on the earth. For a century it had been developing its system of militarism, and, by 1914, the nation had become a trained army of, unequaled efficiency, while its military equipment was, in many respects, complete. Austria, its chief auxiliary in the war, was also in good fighting order, but the same was the case with its neighboring enemies, France and Russia, which had followed the example of Germany in developing a system of militarism. This was not the case with Britain, which had no system of conscription or general training. But, on the other hand, it had the decided advantage of possessing much the greatest naval force in the world, this giving it control of the sea so far as surface navigation was concerned. Such was the position of Germany and its chief enemies when the great European War began in August, 1914. The kaiser, William II, had complete military control of the national Teutonic fighting machine and had long cherished an ambition to lift Germany to the position of autocrat over the nations of the world. At all events, such was apparently the case, it being a very widespread opinion that Kaiser William had made the murder of the Austrian Archduke the pretext for plunging all Europe into war for purposes of his own. In the diplomatic correspondence that followed, the voice of Austria is scarcely heard, the dealings of Russia, France and Britain being with Germany alone.

Germany took the opening part in the

war that was thus forced upon Europe, the vanguard of its army being across the border of Belgium before the exchange of diplomatic notes had ended and war been openly declared. This hasty action was taken advisedly, the purpose being to invade France by a flank attack through Belgium before it could get its army effectively into the field. Belgium, small as it was, defeated this scheme, holding back the invaders while the work of mobilization in France went actively on. When the German invaders at length crossed the French frontier, a powerful and well-equipped army was ready to meet them. At first, indeed, it seemed as if the debacle of 1870 was to be repeated, the French forces, with their small British contingent, falling back before the vigorous German advance until the banks of the Marne were reached and the outer defenses of Paris brought almost within cannon range. Then, with a powerful reverse movement, the armies of France were hurled upon their foes and the German forces driven irresistibly back until their line of defense on the Aisne was reached. Here a trench line had been prepared and at this point began the system of trench warfare which was to be continued in that quarter for years. In the spring of 1918 the Germans pushed again into France, but were stopped and beaten back with the aid of the Americans, who had entered the war in 1917. This last desperate drive was unsuccessful, and to avoid disaster to the German armies, they were compelled to beat a retreat that became a rout. (See *Marne, Château-Thierry, Argonne, St. Mihiel, Soissons.*)

We must deal more briefly with the events of the war in other fields. On the eastern frontier the large army of Russia was quickly in the field, successfully at first, but meeting with disastrous defeat in the invasion of Poland by the army under Von Hindenburg. Warsaw was lost and the Russians driven out of the Carpathian region. The revolution that eventually overthrew the imperial government of Russia so utterly disorganized that country that its armies practically ceased to exist, and propositions for an armistice between the extremists who gained control of the Russian government and the astute German diplomats were made. Another field of warfare in which Germany took active part was that of Italy, the armies of which had made marked advances upon Triest and Trent, during two years of persistent war with the Austrians. In November, 1917, a strong German army came to the aid of the Austrians and so effectively that the Italians were driven back to the line of the Piave. Later in the war the Italians turned the tables and forced the Austrians to surrender, November 4, 1918. The German armistice, which followed a crushing series of Allied attacks in France was signed November 11, 1918. Germany's navy, beyond a well-fought battle off the coast of Jutland (q. v.), remained for the most part in home ports, and ignominiously surrendered to the Allies without a show of fight. Germany's casualties were estimated at 6,338,000; money expenditure $45,000,000,000.

Kaiser Wilhelm abdicated November 9, 1918, and the German states grouped themselves into a republic, under the temporary leadership of Friedrich Ebert, after a number of outbreaks occasioned by the Bolsheviki socialists led by Dr. Karl Liebknecht, who was assassinated in January, 1919.

German Language.—German is one of the Teutonic languages, of Aryan or Indo-European stock. Of these, the Gothic, now long extinct, presents us with the earliest specimens of any Teutonic speech that we possess in the fragments of a translation of the Bible made by Bishop Ulfilas about A.D. 360. Anglo-Saxon comes next; German follows somewhat later. The German dialects spoken in the lower and more northern localities have long exhibited considerable differences from those spoken in the higher and more inland, thus giving rise to the distinction between High German and Low German. Middle High German became literary in the twelfth century, its poetry giving it a predominance as far as Austria. The following century Suabian was the predominant dialect, and its influence is apparent in all the writings of the fourteenth and fifteenth centuries. Ultimately Upper Saxon became the language of literature and cultivated society in consequence of the translation of the Bible by Luther, which may be said to have fixed the New High German.

German Literature.—The literature of Germany received its first impulse from the fondness of the early Germanic races for celebrating the deeds of their gods and heroes. According to Tacitus, the warriors would advance to attack chanting wild war-songs. Of these early songs nothing even in a translated form has been handed down to us. The legends immediately connected with the Gothic, Frankish, and Burgundian warriors of the period of national migration—Dietrich (Theodoric) Siegfried, Hildebrand, etc.—have for the most part some historical foundation, and many of them were eventually incorporated in the *Nibelungenlied*,

the most celebrated production of German mediæval poetry. On the introduction of Christianity was opened another sphere of literary activity. Metrical translations of the Evangelists, the *Krist* and *Heliand*, appeared in the ninth century in the High and Low German dialects, respectively. The *Ludwigslied*, a pæan in honor of the victory of Louis III, king of the Franks, over the Normans in 883, was composed in Old High German by a Frankish ecclesiastic. The preservation of the *Hildebrandlied* is also due to churchmen, who transmitted it partly in the High and partly in the Low dialect. The *Merseburger Gedichte*, two songs of enchantment written in the tenth century, throw light on the ancient religious beliefs of Germany; but in general the hostility of the clergy to the old pagan literature of heroic legends, beast-fables, etc., was not favorable to its preservation.

In the twelfth and thirteenth centuries poetry passed from the monasteries and ecclesiastical schools to the palaces of princes and the castles of nobles. Under the cultured emperors of the house of Hohenstaufen the first bloom of German literature came. Many of the poets of this period were nobles by birth, some of them even princes. Heinrich von Weldeke was the first to introduce into his heroic poem *Eneit* that spirit of devotion to women called by the old Germans *Minne* (Love, hence the name *Minnesänger*, Love-Minstrel). A still greater name is that of Wolfram von Eschenbach, the author of *Parzival*, a poem embodying the legends of King Arthur, the Knights of the Round Table, and the San Graal (Holy Grail). These traditions, together with the exploits of Charlemagne, of Alexander the Great, and the Trojan heroes, inspired also the lays of Gottfried of Strasburg, Hartman von der Aue, and others. These subjects were all taken from the romances of the French *trouvères*, and treated in a style closely resembling theirs. But we have besides real national epics in the *Nibelungenlied* and *Gudrun*. (See *Nibelungenlied, Gudrun.*) The lyrics or minnesongs of this period are not less remarkable than its romances and epics. Perhaps the most gifted lyrist is the celebrated Walther von der Vogelweide. Next to him rank Heinrich von Ofterdingen, Reinmar der alte, and the Austrian poets Nithard and Tannhäuser. Several hundreds of these poets were engaged in traveling from palace to palace and from castle to castle, in the manner of the troubadours of Provence. Their songs were mostly in the Suabian dialect, and the poets constituted what is called the Suabian school. In the thirteenth century didactic poetry began to be cultivated with some success. The dawn of historical literature is heralded by the chronicles of Limburg (1336-98) and of Alsace (1386), but the age of chivalry, as Ulrich von Lichtenstein complained in his poem *Frauendienst*, was declining. During the troublous times of the Interregnum (1256-73) poetry passed to the homes of the private citizen and the workshops. These plebeian songsters formed themselves into guilds in the imperial cities—Nürnberg, Frankfort, Strasburg, Mainz, etc., and were called *Meistersänger*, in contradistinction to the knightly *Minnesänger*.

In the fourteenth century Germany produced several mystical theologians, disciples of Meister Eckhart, the most celebrated of whom were Tauler and Suso, whose sermons and writings paved the way, in some measure, for the Reformation. The only good poetry in the fourteenth, and up to the close of the fifteenth century, were the spirited lays of Halb Suter and Veit Weber, who celebrated the victories of Switzerland over Austria and Burgundy. The invention of printing caused an increasing literary activity, and the works printed in Germany between 1470 and 1500 amounted to several thousand editions. In 1498 there was published the celebrated beast-epic *Reineke Vos* ('Reynard the Fox'). Other popular works were the *Narrenschiff* ('Ship of Fools') of Sebastian Brandt, an allegorical poem in which the vices are satirized; The *Satires* of Thomas Mürner; and (in 1519) *Till Eulenspiegel*, a collection of humorous stories about a wandering mechanic.

In the sixteenth century a new era opens in literature with Luther's translation of the Bible. The writings of Luther, Zwingli (1484-1531), Sebastian Frank (1500-45?), Melanchthon (1497-1560), Ulrich von Hutten (1488-1523), one of the chief writers of the *Epistolæ Obscurorum Virorum*, constitute the principal theological literature of the Reformation. History was now written in a superior style, and with greater comprehensiveness, by Frank in the *Zeitbuch* and *Weltbuch*, and by Sebastian Münster (1489-1552) in his *Kosmographie;* also by Tschudi (1505-72) in *Chronicles of Switzerland* and by Aventinus (1477?-1534), the Bavarian chronicler. The autobiography of Götz von Berlichingen also deserves mention as a sketch of the rude lives of the smaller nobility. Among the poets of this period Hans Sachs (1494-1576), the cobbler of Nurem-

berg, the greatest of the Meistersänger, and Johann Fischart (died 1589), a great satirist, and author of *Das glückhafte Schiff*, stand much above their contemporaries. Many of the hymns and religious lyrics of the age are of high merit, particularly those of Luther, Eber, Waldis, and others. The drama also made considerable progress, Hans Sachs, before mentioned, and Jakob Ayrer (died 1605) being amongst the best writers in this department. But it was in learned and scientific treatises that the age was most prolific. Amongst the chief names in this respect are Luther, Camerarius, Cornelius Agrippa, Paracelsus, Copernicus (astronomy), Leonhard Fuchs (botany and medicine), Conrad Gesner (zoology and classics), and Agricola (mineralogy).

By the beginning of the seventeenth century literature was on the decline. This century is known in German literature as the period of imitation. Most of the poets were graduates of universities; and learned societies were formed for the purpose of improving the language and literature. A new school of poetry, known as the first Silesian school, was founded, of which Martin Opitz (1597-1639) was the leader. His works are more remarkable for smoothness of versification than for true poetic inspiration. As a critic his work *Die Deutsche Poeterie* became a kind of manual for verse makers. Amongst the chief members of the Silesian school were Simon Dach (1605-69), von Zesen (1619-89), Johann Rist (1607-67), and, greatest of all, Paul Fleming (1609-40), whose lyrics are natural and cheerful as the songs of a lark. Of this school also was Andreas Gryphius (1616-64), who may be said to have founded the regular German drama. The second Silesian school, headed by Hoffmann von Hoffmannswaldau (1618-79), and Lohenstein (1635-83), carried affectation to its utmost. Both the Silesian schools were opposed by the 'court poets,' Canitz (1654-99), Besser (1654-1729), and many others who imitated the French school and took Boileau for their guide. Germany's greatest hymn-writer, Gerhardt (1606-75), belongs to this period. Among the best satirists and epigrammatists were Logau (1604-55) and Lauremberg (1591-1659). Amongst novelists Moscherosch, with his *Geschichte Philanders von Sittewald*, and Grimmelshausen in his *Simplicissimus* give graphic pictures of life during the Thirty Years' war. Amongst the scientific and philosophic writers of the period we may mention Kepler (1571-1631), Pufendorf (1632-94), the publicist, and Jakob Böhme (1575-1624), the great mystic who stood almost alone in using the vernacular in communicating philosophical instruction. Leibnitz (1646-1716) was the first to lay a scientific basis for the study of philosophy, but his works were composed chiefly in French and Latin. Wolff (1679-1754), his disciple, shaped the views of his master into a comprehensive system, and published his works in the German language.

In the eighteenth century poetry revived with Haller (1708-77), remarkable as a descriptive poet, and Hagedorn (1708-54), a lyrist of considerable merit. The Saxon school headed by Gottsched (1700-66) aimed at a reformation of German poetry in the direction of French clearness and correctness, modeling the drama as far as possible on the works of Corneille and Racine. These tendencies brought about a violent controversy with a group of writers in Zürich, known as the Swiss school, and headed by Bodmer and Breitinger, who took the English poets as their model, and laid stress on the function of imagination and feeling in poetry. The result of the controversy was that most of the young writers at Leipzig shook off the authority of Gottsched, and even established a periodical (*The Bremer Beiträge*) in which the principles of their former master were attacked. Among the contributors were Rabener (1712-91), a popular satirist with a correct and easy style; Zachariä (1726-77), a serio-comic epic poet; Gellert (1715-69), the author of numerous popular hymns, fables, and a few dramas now forgotten; Kästner (1719-1800), a witty epigrammatist and talented mathematician; Giseke, Cramer, Fuchs, Ebert, and many others of more or less note. To the school of Halle belonged Kleist (1715-59), Gleim (1719-1803), a celebrated fabulist, and others. Gessner of Zürich (1730-87) gained in his time a high reputation as a writer of idyls. With the writings of Klopstock (1724-1803) and Wieland (1733-1813) the classical period of German literature (usually reckoned from 1760) may be said to begin. Though the epic poem of the first (*Messias*) is no longer counted a poem of the first rank, yet Klopstock's work, with its ardent feeling for the spiritual and sublime, is recognized to have had a beneficent effect on German literature. Wieland, a striking contrast to Klopstock, awakened with his light and brilliant verse a greater sense of gracefulness in style. But it was reserved for Gotthold Ephraim Lessing (1729-81) to give a new direction to German literature. He established a new school of

criticism and dealt the fatal blow at French influence. His tragedy, *Emilia Galotti*, his comedy of *Minna von Barnhelm*, and his philosophic drama *Nathan der Weise*, were the best models of dramatic composition which German literature had yet produced, and his direction of the German mind toward Shakespere and the English drama was not the least of the many impulses he contributed to the literary growth of his countrymen. Herder (1744-1803), with his universal knowledge and many-sided activity, followed Lessing as another great influence in the literary world. The researches of Winckelmann (1717-68) in ancient sculpture led to a new understanding of art, as those of Heyne in ancient literature mark the development of modern German scholarship. A union of the students at Göttingen University, where Heyne taught, gave rise to the *Göttinger Dichterbund* or *Hainbund*, among the members of which were Gottfried Aug. Bürger (1748-94), author of *Lenore* and other wild and picturesque ballads and songs; Voss (1751-1826), the translator of Homer, and author of one of the finest German idyls, *Luise*, together with the two brothers Stolberg, Boie, Hölty, Claudius, etc.

This period was followed by a time of transition and excitement known in Germany as the *Sturm-und-Drang Periode* (Storm and Stress period), which found its fullest expression in an early work of Goethe's (1749-1832), the *Sorrows of Werther*. The literary excitement was raised to the highest pitch by the *Räuber* ('Robbers') of Schiller (1759-1805), afterwards the friend and coadjutor of Goethe. By the joint exertions of these two great men German literature was brought to that classical perfection which, from a purely local, has since given it a universal influence. Of a highly individual character are the works of Jean Paul Richter (1763-1825), a writer of profound humor and pathos; and Jung Stilling (1740-1817), whose autobiography holds a peculiar place in German literature for the charming naïveté of its thought and style. In the departments of science and philosophy, we have the names of Moses Mendelssohn (1729-1786); A. G. Baumgarten (1714-62), the founder of the science of æsthetics; the historians Mosheim (1694-1755), Dohm, Möser, Spittler, Johannes Müller; Adelung, the philologist; Basedow and Pestalozzi the educationalists; Ernesti, Spalding, Rosenmüller, and Michaelis, theologians; Eichhorn in theology and universal and literary history; and the scientific writers Blumenbach. Euler, Vega, Herschel, and others. In the field of pure metaphysics Immanuel Kant (1724-1804), was succeeded by Fichte (1762-1814), Hegel (1717-1831), and Schelling (1775-1854).

Partly produced by the influences of the *Sturm-und-Drang* period, and partly trained in the laws of art laid down and worked out by Goethe and Schiller in their many famous and admirable works, the so-called *romantic school*, distinguished by its enthusiasm for mediæval subjects and its love of what is mysterious and transcendental in life or thought, gradually succeeded in gaining public attention about this epoch. Amongst the principal writers of this school after its two great leaders are von Hardenberg, better known as Novalis (1772-1801), a pensée-writer of deep poetic insight; Ludwig Tieck (1773-1853), a writer of tales, dramas, and dramatic criticisms; La Motte Fouqué, Clemens Brentano, Hoffman, Musæus, Werner, von Kleist, etc. The two Schlegels (August Wilhelm, 1767-1845, whose translation of Shakespere is still celebrated, and Friedrich, 1772-1829, best known by his philosophy of history) also belong to this school.

The war of liberation against Napoleon I introduced a strong manly enthusiasm for a time into the hitherto gloomy and melancholy productions of the romanticists. Among the patriotic poets of the time Ernst Moritz Arndt (1769-1860) and Theodor Körner (1791-1813) hold the first place. The ballads and metrical romances of Ludwig Uhland (1787-1872) brought him a world-wide fame. Friedrich Rückert (1789-1866) also may be noticed as a lyric poet of merit. During the excitement produced by the July Revolution in France (1830) a school of writers arose in whose works the social and political ideas of the time were strongly reflected. The most prominent names among this party are Ludwig Börne (1786-1837) and Heinrich Heine (1799-1856), whose writings combine the keenest satire and the finest pathos. Among the better known members of the school is Karl Gutzkow (1811-1878), a popular dramatist and novelist. As in England and France of late, the novel, especially the novel of a social or political character, has taken a prominent place in literature. Most distinguished are Gustav Freytag, Fr. Spielhagen, Paul Heyse, Berthold Auerbach, Fanny Lewald, Hackländer, Reuter, etc. Of late, however, science and learning rather than literature and the arts have produced the names of most eminence. Alexander von Humboldt (1769-1859), one of the first and

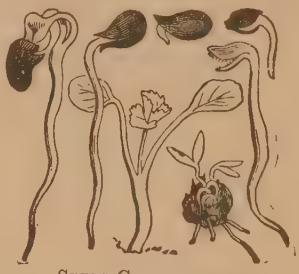
most eminent of these, gave a great impulse to almost all branches of knowledge by his *Cosmos*, his *Travels*, and his *Views of Nature*, and by the general suggestiveness of his labors. In history, Niebuhr and Theod. Mommsen, the historians of Rome; Leopold Ranke, the historian of the popes; Dahlmann, Gervinus, Sybel (French Revolution), Giesebrecht, Julian Schmidt, H. Kurz, and others may be mentioned. Biography has been well represented by Varnhagen von Ense, Pertz, David F. Strauss, and others. German modern theology and Biblical criticism has had lately much influence in the religious world. Baur, Bleek, and Ewald are some of the widely-known names. Histories of art have been written by Kugler, Burckhardt, Lübke, and others. The brothers Grimm—Jakob (1785-1863), Wilhelm (1786-1859), were the founders of a new branch of philological and poetic investigation in ancient German literature. Eminent names in general philological science are those of Bopp, Pott, Schleicher, Steinthal, and Friedrich Müller. In natural sciences, Oken, Burmeister, Carus, Cotta, Liebig, Helmholtz, Virchow, Schleiden, Grisebach, Vogt, Bessel, Brehm, Häckel, Bastian, etc., are the eminent names; in philosophy, Schopenhauer, Feuerbach, Rosenkranz, Kuno Fischer, von Hartmann, Lotze, etc. Amongst recent poets Anastasius Grün (pen-name of Count von Auersperg) and Nikolas Lenau amongst Austrian, and Meissner and Hartmann, natives of Bohemia, have a considerable reputation. Hervegh, Hoffmann von Fallersleben, Freiligrath, and Franz Dingelstedt have infused strong political sentiments into their poetry. Emmanuel Geibel, von Scheffel, Bodenstedt, and others represent a poetry more comprehensive in its aims and tendencies. To these might have been added numerous names of still later date, recent German literature having become very voluminous, though none of the existing writers have yet won eminence.

Germersheim (ger'-mĕrz-hīm), a town and fortress in the Bavarian Palatinate on the Rhine, 8 miles S. W. of Spier. Pop. (1905), 5914.

Germinal (Fr. zhăr-mē-nal), the seventh month of the first French republican calendar, March 21—April 19.

Germinal Vesicle (jer'mi-nal), (*a*) in animal physiology, the nucleus of the ovum or egg of animals. It contains within it a nucleolus called also the *germinal spot*. The germinal vesicle undergoes important changes in the early stages of the development of the egg into the embryo. (*b*) In botany a cell contained in the embryo sac, from which the embryo is developed.

Germination (jer-mi-nā'shun), the first act of growth by an embryo plant. The immediate causes of germination are the presence of moisture and atmospheric air and a certain elevation of temperature. Moisture softens the integuments of the seed and relaxes the tissue of the embryo; atmospheric air supplies oxygen and nitrogen; and a temperature which must be at least as high as 32° Fahr., by exciting the



Seeds Germinating.
In center a plant which has newly appeared above ground.

vitality of the embryo, enables it to take advantage of the agents with which it is in contact. During germination various changes take place in the chemical constituents of the seed, and are usually accompanied with increase of temperature, as is seen in the process of malting. Along with these other changes commonly take place: a root is produced, which strikes perpendicularly downwards and, fixing itself in the soil, begins to absorb food; a growth upwards then commences and ends in the protrusion of a stem and leaves.

Germ Theory of Disease, the theory that certain diseases are communicated from an infected person to an uninfected one by living organisms which gain access to the body of the afflicted person by the air or food, or drink, and which, growing and multiplying in the body they invade, produce the changes characteristic of the particular disease. The period during which the living particles of contagious matter retain their vitality, like the rate of their growth and multiplication, varies in different cases, but it is limited in all. Few, if any, resist the destructive influence of a temperature of 300° Fahr., while most succumb at the temperature of 200° or even less, particularly if exposed for some

time. Many of them are capable, however, of withstanding great reduction of temperatures. Animal poisons generally are destroyed by boiling, and clothes, sheets, etc., infected, may be rendered pure by being exposed to a temperature of 300° Fahr. These living organisms are grouped together as microbes or micro-organisms, and are divided into different classes. The *micrococcus* is a round form about the 32,000th of an inch in size, and multiplies by fission. The *bacterium* is rod-shaped, about the 10,000th of an inch long, with rounded ends; it also multiplies by fission. The *bacillus* is a third form also rod-shaped, and somewhat larger than the bacterium. They often form long chains or threads, and increase by division and by spore formation. *Vibrio* and *spirillum* are somewhat similar forms; and, like the others, increase with a rapidity beyond conception. The connection between these micro-organisms and the various forms of zymotic disease has been thoroughly established. The only method of investigation that yields reliable results, is to separate the organism supposed to be the cause of the disease, and cultivate it outside of the body. Thus a drop of blood from a person suffering from a special disease, which contains the bacteria, or bacilli, etc., believed to be the producers of the disease, is placed in a flask containing a nourishing material, care having been taken to destroy all other organisms in the flask. The special microbe flourishes there, let us suppose. It is then cultivated in one flask after another through successive generations, only a single minute drop of the material in one flask being used to inoculate a succeeding one. In this way a pure cultivation is obtained, a cultivation, that is, containing the particular microbe and none other. If this is the true cause of the disease, then a drop of the solution containing it introduced into the body of an animal, capable of receiving the disease, ought to produce it, and the particular organism introduced should be found multiplying in the blood and tissues of the infected animal. Such a demonstration has been given of the cause of a few diseases. Dr. Koch, of Berlin, published in 1876 a paper giving a full account of the life history of the bacillus organism which had been observed in animals dead of splenic fever; and in 1877 the great French chemist, Pasteur, proceeded to investigate the subject, and his investigations conclusively support the germ theory of disease. In 1882 Dr. Koch, of Berlin, announced the discovery of a micro-organism in tuberculosis, sometimes called consumption when infecting the lungs. This is found not only in the lungs of persons who have died of tubercle, but also in the saliva of tubercular and consumptive patients, and multiplies also by spores. Thus it is that the spittle of a consumptive patient, even after it has dried up, may be capable of imparting the disease, owing to spores being scattered in the air. After the epidemic of cholera in Egypt in 1883, which spread to France and Italy, investigations were undertaken by French, German, and British commissioners. Dr. Koch detected a peculiar bacillus, shaped like a comma (,), in the intestines of persons who had died of cholera, in the discharges from cholera patients, etc. He believed that this bacillus was the active agent in the production of the disease. All investigation, in short, seems to point to the fact that every infectious or contagious disease is due to some form of micro-organism, and that there is one particular organism for each particular disease. Each organism produces its own disease and none other; and the special disease cannot arise unless its germ has gained entrance to the body. The channels through which these germs obtain entrance are innumerable, but they have one origin and one only, and that is a preceding case of disease. In the case of cholera and typhoid fever the deleterious microbes seem generally conveyed by impure drinking water; the germs of some other diseases appear to be transmitted by the air; others are conveyed by insects, as yellow fever by one species of mosquito, malaria by a second species, and sleeping sickness by the tsetse fly; even our common house fly is known to be a source of danger in this direction. The 'germ theory' affords the hope and suggestion of a method of diminishing, if not of getting rid of, such diseases altogether, and to some extent also indicates the direction in which their cure is to be sought. If the particular microbe of each contagious disease were known, the condition of its life and activity understood, there is great probability that its multiplication in the living body could be arrested, and the disease thus cured. Even without such knowledge, however, the germ theory indicates that the means for arresting the spread of contagious diseases and diminishing their occurrence consist in preventing the spread of the germs from an existing case of disease. It is well to state that the disease-bearing microbes are only a few of the many species known, the most of them being harmless and really of great benefit to mankind.

in various ways. Also to state that these organisms are not all vegetable, like the bacteria, some of them being animal. See *Disinfectant.*

Gérôme (zhā-rōm), JEAN LÉON, a French painter, born in 1824 at Vesoul. He went to Paris and studied under Paul Delaroche. In 1853 he traveled in the East. In 1855 the first of his great pictures, *The Age of Augustus* and the *Birth of Christ*, appeared, and four years later his picture of the Roman gladiators, *Ave Cæsar Morituri te salutant.* In 1861 he exhibited his celebrated *Phryne before her Judges.*

Jean Léon Gérôme

His other works include *Death of Cæsar, The Plague at Marseilles, Rex Tibicen, L'Eminence Grise,* and *various scenes* from Oriental life. M. Gérôme was decorated with the Prussian order of the Red Eagle and made a commander of the legion of honor. He died in 1904.

Gerona (hā-rō'nȧ), a fortified town of N. E. Spain, capital of the province of Gerona, in Catalonia, at the confluence of the Oña and the Ter, 52 miles northeast of Barcelona. It consists of an old and a new town, the former on the slope of a hill, with antiquated houses and a stately cathedral. There are spinning and weaving; also paper factories. Gerona was once the residence of the Kings of Aragon, and as a place of strategic importance has sustained many memorable sieges. Pop. 15,787.—The PROVINCE, area 2270 square miles, abuts on the Mediterranean, is mountainous and mostly rugged, but with many fertile valleys, which produce olives, wine, wheat, rye, etc. Pop. 299,287.

Geronimo (jē-ron'i-mō), an Apache chief, noted in American frontier history. In 1884 and 1888, at the head of a band of hostile Indians, he was active in Arizona, committing many outrages on the white settlers. He surrendered to General Crook, in 1886, under an agreement that his band and their families should reside for two years in the East. But while negotiations were pending, he escaped with his followers to the mountains, where he remained until driven to exhaustion by General Miles. He and his associates were finally settled at Fort Sill, Okla.

Gerry (jer'ri), ELBRIDGE, statesman, born in Marblehead, Massachusetts, in 1744. He was a member of the Continental Congress; delegate to the Constitutional Convention; member of congress 1789–93; commissioner to France 1792–98; governor of Massachusetts 1810–12, and Vice President of the United States from March 4, 1813, till his death, November 23, 1814.

Gerrymander (ger'i-man-der), in American political history the name, first used in Massachusetts in 1812, given to an unfair political arrangement of electoral districts. It had its origin from a bill signed by Gov. Elbridge Gerry, which so apportioned a senatorial district in Republican interests that from its fantastic shape on the map it was said to resemble a salamander. Gerrymander was substituted for salamander, and the name persists to this day, although Governor Gerry was not responsible for the bill he signed.

Gers (zhār), a department in the s. w. of France, separated from the Bay of Biscay by the department of Landes; area 2425 square miles. The southern part is covered with ramifications of the Pyrenees separated by valleys, each of which is watered by its own stream. The chief of these are the Gers, Losse, Save, etc. More than half the land is under the plow, and about a seventh in vineyards. Much of the wine is made into Armagnac brandy. Auch is the capital. Pop. (1906) 231,088.

Gerson (zhār-sōn), JEAN DE, properly JEAN CHARLIER, a celebrated French theologian, born at Gerson in 1363. He was ardent and courageous in advocating improvements and reforms. When the Council of Constance (1414–18) in which he took a leading part, proved unable to settle the differences

existing in the church, he at last gave up the struggle in despair, and not daring to return to France, where his enemies had then the upper hand, sought shelter for a time in Bavaria and Austria. In 1419 he returned to his native country, and spent the last ten years of his life with his brother, the prior of a community of Celestine monks at Lyons, living an ascetic life, and devoting himself to religious meditation and the composition of theological and other treatises. The authorship of the *Imitation of Christ*, by Thomas à Kempis, was at one time erroneously ascribed to him.

Gerstäcker (ger-stek'ĕr), FRIEDRICH, a German traveler and novelist, born at Hamburg in 1816; died in 1872. In 1837 he came to America, where he earned a living by the most various employments—as a sailor, stoker, innkeeper, woodcutter, and trapper and hunter in the prairies of the west. He returned to Germany in 1843, and began his literary life by the publication of his experiences in America, *Streif- und Jagdzüge durch die Vereinigten Staaten Nordamerikas* (Dresden, 1844). This was followed by *Die Regulatoren in Arkansas; Die Flusspiraten des Mississippi; Mississippibilder*, etc. In 1849 Gerstäcker was engaged on behalf of the German government to collect information which might be useful to German emigrants. The results were published under the title of *Reisen* in 1853. He afterwards made voyages to South America, to Egypt, West Indies, and other places, which are described in his *Neue Reisen* (1868). Amongst his many romances (most of which may be had in English) are *Die beiden Sträflinge* (1856), *Im Busch* (1864), *General Franco* (1865), *Californische Skizzen* (1856), and others.

Gerund (jĕr'und), the name given originally to a part of the Latin verb which possesses the same power of government as a verb, but also resembles a noun in being governed by prepositions. In early English or Anglo-Saxon a dative form of the infinite is used to indicate purpose, and is often called the gerund. In modern English what seems to be a present participle governed by a preposition is sometimes denominated a gerund, in such phrases, for example, as 'fit for teaching'; but this is merely a verbal noun representing the old Anglo-Saxon noun ending in *-ung*.

Gervaise, or GERVASE (jer'vāz), a monk of Canterbury, born in 1150. Amongst his writings is an important chronicle, *Chronica de tempore regum Angliæ, Stephani, Henrici II et Ricardi I.* It is reprinted in Twysden's collection. Gervaise died probably about 1200.

Gervaise (or GERVASE), OF TILBURY, a chronicler of the twelfth and thirteenth centuries, born at Tilbury in Essex about the middle of the twelfth century. Having completed his studies in England, he visited the courts of Italy and of Germany, was appointed by Otto IV Marshal of the Kingdom of Arles. He died, according to some in 1218. His chief works are *Otia Imperialia* (containing a history of the kings of France and England); *Illustrationes Galfridi Monemuthensis* ('Illustrations of Geoffrey of Monmouth'); *Historia Terræ Sanctæ* ('History of the Holy Land'); *De Origine Burgundiorum* ('On the Origin of the Burgundians'). Most of his writings still remain in manuscript in the Cottonian collection and the Corpus Christi library, Cambridge.

Gervas (jer'vas), a small shrub, the *Stachytarpheta Jamaicensis*, nat. order Verbenaceæ, a native of the West Indies and warm parts of America, the leaves of which are sold in Austria under the name of Brazilian tea, and used in Britain to adulterate tea.

Gervinus (ger-vē'nus), GEORG GOTTFRIED, a German critic and historian, born at Darmstadt in 1805. He quitted commerce in 1825 to study at Heidelberg, was for some time a teacher, and qualified as a privatdocent. After a visit to Italy he published his *Geschichte der Poetischen Nationalliteratur der Deutschen* ('History of the Poetic National Literature of the Germans'). In 1835 he was appointed extraordinary professor at Heidelberg, and the following year ordinary professor of history and literature at Göttingen; but in 1837, being one of the seven professors who protested against King Ernst August's breach of the constitution, he was banished from Hanover. After another visit to Italy he returned to Heidelberg, where in 1844 he was appointed an honorary professor. He now began to take an active part in politics on the liberal side; became editor of the newly-founded *Deutsche Zeitung*, and was returned to the federal diet by the Hanse towns. Discontented with the tendency of affairs after 1848, he gave up politics and resumed his old studies. In 1849 he published the first of his great work on Shakespere, in 1853 his *History of German Poetry*, and in 1855 the first volume of his *History of the Nineteenth Century*, which, however, was never carried farther than the French revolution of 1830. Amongst his last writings was

a critical essay on *Handel and Shakespere.* He died in 1871.

Gesenius (ge-sē'ni-us), FRIEDRICH HEINRICH WILHELM, a German orientalist and Biblical critic, born in 1786, studied at Göttingen, and became professor of theology at Halle. In 1810-12 his *Hebrew and Chaldee Dictionary of the Old Testament* appeared. In 1820 he visited Paris and Oxford for the purpose of collecting materials regarding the Semitic languages. In 1829 he published his large *Thesaurus philologico-criticus Linguæ Hebraicæ et Chaldaicæ*, completed in 1858 by Rödiger. Besides the works mentioned, Gesenius wrote a *Hebrew Grammar*, a history of the Hebrew language, and notes to the German translation of Burckhardt's *Travels in Syria and Palestine.* He died in 1842.

Gesner (ges'nêr), ABRAHAM, geologist, born at Cornwallis, Nova Scotia, in 1797; died in 1864. He was appointed in 1838 to examine the geological resources of the lower provinces of Canada, and discovered how to produce oil for lamps from bituminous shale and cannel coal. To this oil he gave the name of 'kerosene.'

Gesner (ges'nêr), KONRAD VON, a German, born at Zürich in 1516, studied at Strasburg, Bourges, and Paris, and became schoolmaster in his native town. Hoping to raise himself from his needy condition, he went to Basel, and devoted himself particularly to the study of medicine. Afterwards he became successively professor of Greek at Lausanne, and of philosophy at Zürich. He did important work in the departments of history, zoology, and botany. His *Bibliotheca Universalis* is a descriptive catalogue of all writers extant in Greek, Latin, and Hebrew. His *Historia Animalium* must be regarded as the foundation of zoology; and in botany he was the inventor of the method of classifying the vegetable kingdom according to the characters of the seeds and flowers. He died of the plague at Zürich, 1565.

Gesneraceæ (ges-ner-ā'se-ē), an order of monopetalous exogens, typical genus *Gesnera.* There are many species, mostly natives of tropical and subtropical regions. They are shrubby herbs, often with tuberous rhizomes, and scarlet, violet, or blue flowers. Some of the genera are frequent in our hothouses, such as Gloxinia, Achimenes, Gesnera, etc.

Gessler. See *Tell.*

Gessner (ges'nêr), SALOMON, a German poet and artist, was born at Zürich in 1730; died there in 1787. In 1749 he was sent by his father to learn the business of bookselling at Berlin, but having taken a dislike to the business he maintained himself by executing landscapes. On his return to Zürich he published *Daphnis*, a small volume of idyls, and *Tod Abels* ('The Death of Abel'), a kind of pastoral idyl in prose. These idyls acquired for him a great reputation amongst contemporaries. For some years afterwards he devoted himself to the engraving art, in which he also became very eminent.

Gesta Romanorum (ges'ta rō-ma-nō'rum; 'Deeds of the Romans'), the usual title of a collection of short tales, legends, etc., in Latin, very popular during the middle ages. The book was probably written about the close of the thirteenth century by a certain monk Elinandus, an Englishman or a German. The separate tales making up the *Gesta* are of very various contents, and belong to different times and countries, the sources from which they are derived being partly classical, partly oriental, and partly western. Whatever may have been the intention of the original compiler, they very soon were adapted to the moralizing tendencies of the time, and moral reflections and allegorical interpretations were added to them, it is said, by a Petrus Bercorius or Pierre Bercaire of Poitou, a Benedictine prior. After the Reformation the book fell into oblivion.

Gestation (jes-tā'shun; Latin, *gestare*, to bear), in physiology, the name given to the interval which elapses between the impregnation of any of the mammalia and the period of birth. This period varies from 25 days, in the case of the mouse, to 620, in that of the elephant.

Geste, CHANSONS DE. See *France—Literature.*

Getæ (ge'tē), an ancient people of Europe, dwelling at first in Thrace; afterwards a part of them moved west on the north bank of the Danube, where they were known to the Romans as the Daci. (See *Dacia.*) Another portion moved east into Asia.

Gethsemane (geth-sem'a-nē; 'oil-press'), an olive garden or orchard in the neighborhood of Jerusalem, memorable as the scene of the last sufferings of our Lord. The traditionary site of this garden places it on the east side of the city, a very little beyond the Kedron, near the base of Mt. Olivet. It contains some very old olive-trees, piously regarded as having stood there in the time of our Lord.

Gettysburg (get'tis-burg), a city, the capital of Adams County, Pennsylvania. Here are the Pennsylvanian College (Lutheran), founded in 1832; the national cemetery for Union soldiers, and a national homestead for the orphans of Union soldiers. At Gettysburg a battle was fought (July 1, 2 and 3, 1863) between the Union forces under General Meade and the Confederate forces under General Lee, in which the latter suffered defeat. This great battle was the turning point in the Civil war, the critical event in the great struggle of the North and South, and in consequence the battlefield has been converted into a national park, adorned with numerous monuments erected by the regiments engaged. To these, in 1910, the State of Pennsylvania added a noble monument, on which are inscribed the names of all Pennsylvanians who took part in the batile. Pop. 4030.

Geum (jē'um), a genus of hardy herbaceous perennials, belonging to the nat. order Rosaceæ, chiefly natives of the northern parts of the world. *G. Canadense*, chocolate-root, or bloodroot, a North American species, has some reputation as a tonic. A species of saxifrage is also called *Geum*.

Geyser (gī'zer), a slight alteration of the Icelandic name *geysir*, from *geysa*, to gush or rush forth, and applied to natural springs of hot water of the kind that were first observed in Iceland. The geysers of Iceland, about a hundred in number, lie about 30 miles N. W. of Mount Hecla, in a plain covered by hot springs and steaming apertures. The two most remarkable are the Great Geyser and the New Geyser or Strokkur (churn), the former of which throws up at times a column of hot water to the height of from 80 to 200 feet. The basin of the Great Geyser is about 70 feet across at its greatest diameter. The New Geyser, which is only 100 yards distant, is much inferior in size. The springs are supposed to be connected with Mount Hecla, and the phenomenon of eruption has been explained by Tyndall as due to the heating of the walls of a fissure, whereby the water is slowly raised to the boiling point under pressure, and explodes into steam, an interval being required for the process to be repeated. The geysers of Iceland, however, have been surpassed by those discovered in the Rocky Mountains in the Yellowstone region of the State of Wyoming, the largest of which throw up jets of water from 90 to 250 feet high. (See *Yellowstone*.) The hot-lake district of Auckland, New Zealand, is also famous in possessing some of the most remarkable geyser scenery in the world. These phenomena are of three kinds; the puias (fire-springs), geysers continually or intermittently active; mgawhas or inactive puias, which emit steam, but do not throw up columns of water; and waiariki or hot-water cisterns. This region formerly was remarkable for the number of natural terraces containing hot waterpools or cisterns, and its lakes all filled at intervals by the boiling geysers and thermal springs, but the configuration of the country was considerably altered by a disastrous volcanic outbreak in 1886, its beautiful pink and white terraces being destroyed. Ngahapu or Ohopia, a circular rocky basin, 40 feet in diameter, in which a violent geyser is constantly boiling up to the height of 10 or 12 feet, emitting dense clouds of steam, is one of the natural wonders of the southern hemisphere, and is much visited by tourists traveling through New Zealand.

Ghadames (ghâ-dā'mes), a town of North Africa, in the southwest of Tripoli. It is about 310 miles S. W. of the town of Tripoli, is situated in the midst of an oasis, and is the center of caravan routes to Tunis, Tripoli, etc. Figs, dates, barley, wheat, etc., are grown in the gardens, which are watered by a hot-spring. Pop. about 7000.

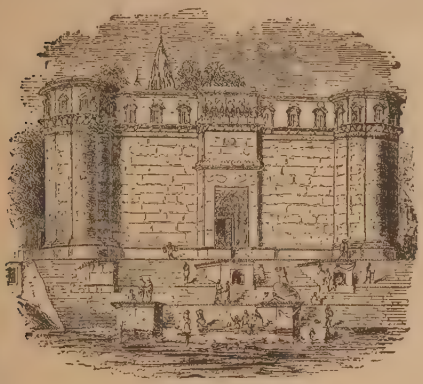
Ghagra, or GHOGRA. See *Gogra*.

Ghara, or GARRA (gâr'râ), a river in the Punjab, being the name by which the united streams of the Bias and Sutlej are known, from their confluence at Endrisa to the junction with the Chenab, after which the united waters flow under the name of the Punjnad to the Indus. The Ghara is about 300 miles long.

Ghâts (gäts), or GHAUTS, EASTERN and WESTERN, two ranges of mountains in the peninsular portion of Hindustan, the former running down the east side of India, but leaving broad tracts between their base and the coast; the latter running down the west side, but leaving only a narrow strip between them and the shore. Both meet near Cape Comorin. The general elevation of the Western Ghâts varies from 4000 to 7000 feet. Its best known portion is the Neilgherries, with Dodabetta Peak, their highest point 8760 feet above the sea. The Western Ghâts form a watershed, and the rain collected on its eastern slopes makes its way right across India to the Bay of Bengal. They are covered with fine forests, and have most picturesque scenery. The Eastern Ghâts are of

considerably less elevation, on the average about 1500 feet, and have none of the beauty of the western range. They are, however, rich in metals.

Ghâts (gäts), or GHAUTS, a Hindu term employed to designate landing-stairs on a river, especially when



Ghoosla Ghât, Benares.

large and substantially constructed. These ghâts are very numerous on the Ganges, and are great places of resort by the people of the towns where they

Bathing Ghâts on the River Jumna at Muttra.

are situated. Some of them are noteworthy from an architectural point of view, having temples, bathing-houses, etc., at the top.

Ghazipur (gä-zē-pör′), a town in Hindustan, headquarters of the Ghazipur District, Northwestern Provinces, about 44 miles northeast of the town of Benares. It stretches along the banks of the Ganges; has a trade in sugar, tobacco, rose-water, and otto of roses; and is a healthy place. The ruins of the Palace of the Forty Pillars, and a monument to Lord Cornwallis, who died here in 1805, are here. Pop. 39,429. The district, one of the hottest and dampest in the N. W., has an area of 1473 sq. miles.

Ghazni (gäz′nē), GHUZNEE, or GHIZNI, an ancient and celebrated city and fortress in Afghanistan, 84 miles S. S. W. of Cabul, on an eminence 7726 feet above sea-level. The wall embraces the whole of the hill; the houses are of mud; the streets, dark, narrow, and irregular. The country round Ghazna is very productive in grain, fruits, tobacco, etc. Three miles northeast are the ruins of the ancient city, which under the celebrated Sultan Mahmud (999-1030) (see *Ghaznavides*), was the capital of a great empire. It has been twice taken by British forces (1839 and 1842). Pop. est. about 10,000.

Ghaznavides (gäz′-na-vīdz), a dynasty founded in 961 by Alepteghin, originally a slave belonging to the Ameer of Bokhara. Ghazna was the seat of his power, and became, under his successors, the capital of an empire which reached from the Tigris to the Ganges, and from the Sihon to the Indian Ocean. The most brilliant period of the dynasty was that of Sultan Mahmud (999-1030). It became extinct towards the end of the twelfth century after having lost most of its possessions.

Ghebers (gē′bėrz). See *Guebres.*

Ghee (gē), or GHI, a peculiar kind of butter in use among the Hindus. It is made from the milk of the buffalo or the cow. The milk is boiled for an hour or so, and cooled, after which a little curdled milk is added. Next morning the curdled mass is churned for half an hour; some hot water is then added, and the churning continued for another half-hour, when the butter forms. When after a few days it becomes rancid, it is boiled till all the water is expelled, and a little more curdled milk added with some salt or betel-leaves, after which it is put into pots. In this state it will keep for a long time. It is too strong for European taste, but is a favorite article of consumption amongst rich Hindus.

Gheel (gāl), a village and commune in Belgium, 26 miles E. S. E. of the town of Antwerp and in the province of that name. It is situated in a fertile spot in the midst of a sandy waste, and is inhabited by a class of peasant farm-

ers. It has manufactures of cloth, hats, wax and tallow candles, etc.; tanneries, dyeworks, ropeworks, etc., and a considerable trade in butter. The commune has been long remarkable for containing a colony of deranged persons, numbering at present about 1600, who are lodged and boarded in the houses of the country people, who make use of their services, when available, in field and other labor. Little or no restraint is employed, and the best effects thence ensue. Lately a hospital has been erected, with a medical staff, for the supervision of the relations between the insane and their custodiers. Patients are sent hither from all parts of Belgium. Pop. 14,087.

Ghent (gent; French, *Gand;* Flemish, *Gend* or *Gent*), a town in Belgium, capital of the province of East Flanders, in a fertile plain at the confluence of the Lys with the Scheldt. It is upwards of 6 miles in circumference, and is divided by canals into a number of islands connected with each other by bridges. Except in some of the older parts it is well built, and has a number of fine promenades and many notable buildings. Amongst the latter are the cathedral of St. Bavon, a vast and richly-decorated structure, dating from the thirteenth century; the church of St. Nicholas, the oldest in Ghent; the church of St. Michael, with a celebrated *Crucifixion* by Vandyk; the university, a handsome modern structure, with a library of about 100,000 volumes and 700 MSS.; the Hôtel-de-Ville; the Belfry, a lofty square tower surmounted by a gilded dragon, and containing a fine set of chimes consisting of forty-four bells, one of which is the famous 'Roland of Ghent'; the new Palais de Justice; the Marché du Vendredi, an extensive square, interesting as the scene of many important historical events; and Les Béguinages, extensive nunneries founded in the thirteenth century, the principal occupation of whose members is lacemaking. Ghent has long been celebrated as a manufacturing town, especially for its cotton and linen goods and lace. Other industries of importance are sugar-refining, hosiery, thread, ribbons, instruments in steel, carriages, paper, hats, delftware, tobacco, etc. There are also machine-works, engine-factories, roperies, tanneries, breweries, and distilleries. The trade is very important. A canal 16 feet deep and 11 yards wide, connects it with the Scheldt at Terneuzen, but is less used than it might be on account of the heavy imposts levied by Holland on vessels passing through. Another canal connects the Lys with the canal from Bruges to Ostend. A new dock, capable of holding 400 vessels, was opened in 1881. Population, 162,482. It is mentioned as a town in the seventh century. In the ninth century Baldwin, the first count of Flanders, built a fortress here against the Normans. Under the counts of Flanders Ghent continued to increase, and in the fourteenth century could send 50,000 men into the field. The wealth and liberty of its citizens disposed them to a bold maintenance of their privileges against the encroachments of feudal lords like the Dukes of Burgundy and the Kings of Spain. In 1792 the Netherlands fell under the power of France, and Ghent became the capital of the department of Essaut (Scheldt). In 1814 it became, along with Flanders, part of the Netherlands, till the separation of Belgium and Holland. See *Belgium.*

Ghent, TREATY OF, the treaty which brought to a close the war between the United States and Great Britain, 1812-14. It was negotiated at Ghent, Belgium, by representatives of the two countries, and was signed on December 24, 1814. Although the United States had gone to war primarily because Great Britain had impressed American seamen and hampered American commerce, no mention was made of either in the treaty. As ratified it declared for 'firm and universal peace' and stipulated that all territory (with the exception of the Passamaquoddy islands), taken during the war should be returned.

Gherardesca (gā-rär-des'kȧ), a family of Tuscan origin which plays an important part in the history of the Italian republics of the middle ages. Historically the most prominent member of the family is Ugolino, whose death, and that of his two sons and grandsons, by starvation in the 'Tower of Hunger,' is described in one of the celebrated passages of Dante's *Divina Commedia.*

Ghetto (get'to), the name frequently applied to the Jewish quarter of large cities.

Ghibellines (gib'el-līnz), the name of a political party in Italy, which, in general, favored the claims of the emperor against those of the pope. The name is said to be derived from Waiblingen, a small estate belonging to the Hohenstaufen princes. See *Guelfs and Ghibellines.*

Ghiberti (gē-ber'tē), LORENZO, an Italian statuary, born about 1378 at Florence; died about 1455. He early learned from his stepfather, Bartaluccio, an expert goldsmith, the arts of drawing and modeling, and that of

casting metals. He was engaged in painting frescoes at Rimini, in the palace of Pandolfo Malatesta, when the priori of the society of merchants at Florence invited artists to propose models for one of the bronze doors of the baptistry of San Giovanni. The judges selected the works of Donatello and Ghiberti as the best (according to Vasari, also that of Brunelleschi, who is not mentioned by Ghiberti himself as one of the competitors); but the former voluntarily withdrew his claims, giving the preference to Ghiberti. After twenty-one years' labor Ghiberti completed the door, and, at the request of the priori, executed a second, after almost as long a period. Michael Angelo said of these, that they were worthy of adorning the entrance to paradise. During these forty years Ghiberti also completed other works, bas-reliefs, statues, and some excellent paintings on glass, most of which may be seen in the cathedral and the church of Or San Michele at Florence.

Ghika (gē'ka), Helena, Princess Koltzoff-Massalsky, better known by the pseudonym of Dora d'Istria, a writer of travels, historical studies, and novels. She was the daughter of Prince Michael Ghika, and niece of Gregory Ghika X, hospodar of Wallachia, and was born at Bukarest in 1828. She was carefully educated, and acquired by frequent travels an extensive knowledge of modern languages and literature. In 1849 she was married to Prince Koltzoff-Massalsky. Her first important work, *La Vie Monastique dans l'Eglise Orientale*, was published at Paris in 1855. *La Suisse Allemande, Les Femmes en Orient, Des Femmes par une Femme*, represent social and political studies on modern civilization. In *Au bord des Lacs Helvétiques* (1864) she collected a number of stories written for the *Revue des Deux Mondes*. Amongst her other works are *Eli Albanesi in Rumenia;* and *La Poésie des Ottomans* (1877). She also won distinction as a landscape painter. She died in 1888.

Ghilan (gi-lân'), a province of Persia, on the southwest shore of the Caspian Sea; area, about 4250 square miles. The lofty range of the Elburz Mountains forms its southern boundary. The whole province, except where cleared for cultivation and on the mountain summits, is covered with woods, and the excessive rain and dense vegetation render much of the level country a morass. The climate is consequently unhealthy. The province is rich in metals and very fertile. The capital is Resht. Pop. about 250.000.

Ghirlandaio (gēr-län-dä'yō), or Corradi Domenico, one of the older Florentine painters, born at Florence in 1450; died 1495. He was the son of a goldsmith known as Il Ghirlandaio (the garland-maker), from his skill in making garlands. He was distinguished by fertility of invention, a more natural rendering of life, and a more accurate perspective than his predecessors. Amongst his best works are the frescoes in the Sassetti Chapel of the Trinity Church and in the choir of Santa Maria Novella at Florence, and the pictures in the Uffizi and the academy at Florence. Michael Angelo was one of his pupils.

Ghizeh. See *Gizeh.*

Ghiznevides. See *Ghaznavides.*

Ghizni. See *Ghazni.*

Ghoorkas. See *Goorkhas.*

Ghost Dance, a religious ceremony of the Piute Indians of Nevada, originating about 1889, so-called from the fact that the dancers wore a white shirt over their ordinary dress. It arose from a belief that a Messiah was soon to appear who would drive the white men from the land. It took place at night, the dancers singing the ghost songs, chants in the form of messages from their spirit friends. It quickly spread to other tribes, and led indirectly to the Sioux outbreak of 1890-91.

Ghost-moth, a nocturnal lepidopterous insect (*Hepiălus humŭli*), so called from the male being of a white color, and from its habit of hovering with a pendulum-like motion in the twilight over one spot (often in churchyards), where the female, which has gray posterior wings and red-spotted anterior wings, is concealed.

Ghur, or Ghor (gŏr), a mountainous district of Afghanistan, between Herat and Candahar, peopled by Mongol tribes who are practically independent. It was the original seat of the second Mohammedan dynasty in Hindustan, the princes of Ghur, who, in the eleventh and twelfth centuries, included in their kingdom of Ghur, Afghanistan, Lahore, Sind, and Khorasan.

Ghuznee. See *Ghazni.*

Giallo Antico (jäl'ō än-tē'kō), the Italian name of a kind of fine yellow marble, used in ancient Roman architecture and obtained from Numidia.

Gianibelli or GIAMBELLI (jän-i-bel'lē, jäm-bel'lē), FEDERIGO, an Italian military engineer, born at Mantua about 1530. After having offered his services to Philip II of Spain without much result, he went to England, where Elizabeth gave him a pension and sent him to help the Netherlanders in their defense of Antwerp against the Spaniards (1585). Here he made himself famous by the damage which his inventions did to the enemy. After this he returned to England, where he fortified the coast-line against the Spanish invasion, and suggested the use of fireships, which were so disastrous to the Armada.

Giannone (jän-ō'nā), PIETRO, an Italian author equally celebrated by his fate and by his writings, born in 1676. He studied law in Naples, and after winning a high place as an advocate retired to give himself up to the execution of his great work, the *Civil History of the Kingdom of Naples* (1723). The severity with which Giannone treated the church, and the attacks which he made on the temporal power of the popes, drew upon him the persecutions of the court of Rome, and of the clergy in general. The offensive publication was burned, and the author excommunicated. Giannone therefore quitted Naples, 1723, and took refuge in Vienna, where, for a time, he was protected by the influence of powerful friends, but had ultimately to leave and betake himself to Venice in 1734. Expelled from Venice by the suspicious republic, he finally took refuge in Geneva. Here he wrote his *Triregno*, a bitter attack on the papal pretensions. In 1736, having been enticed by a government emissary to enter the Sardinian States, he was seized and imprisoned in the citadel of Turin, where he died in 1748.

Giant Powder, a name in America for dynamite.

Giants (jī'antz), people of extraordinary stature. History, both sacred and profane, makes mention of giants, and even of races of giants, but this in general occurs only at that early stage of civilization when the national mind is apt to exaggerate anything unusual. Hence the Cyclopes and Læstrygones of the ancients and the Cornish and Welsh giants of English folk-lore. The first mention of giants in the Bible is in Gen., vi. 4, where the Hebrew word used is *nephilim*, a word which occurs in only one other passage, where it is applied to the sons of Anak, who dwelt about Hebron, and who were described by the terrified spies as of such size that compared with them they appeared in their own sight as grasshoppers. A race of giants called the Rephaim is frequently mentioned in the Bible, and in Gen., xiv, and xv, appear as a distinct tribe, of whom Og, king of Bashan, is said to have been the last. Other races of giants are mentioned, such as the Emim, the Zuzim, and the Zamzummim. The giants of old Greek or of Norse mythology have, of course, merely a symbolic existence, representing benignant or adverse forces of nature on which man might count in his struggle to reduce the world around him into some kind of order. The tales of old writers regarding gigantic human skeletons have now no importance, it being mostly certain that these bones do not belong to giants, but to animals of the primitive world which, from ignorance of anatomy, were taken for human bones. The ordinary height of men is between 5 and 6 feet; amongst the Patagonians of South America, however, the average seems to be considerably higher, though not so high as to entitle them to be considered a race of giants. Notable deviations from this medium height are not at all uncommon, especially among the Teutonic peoples. The following are amongst authentic instances, ancient and modern, of persons who attained to the stature of giants: The Roman Emperor Maximin, a Thracian, nearly 9 feet high; Queen Elizabeth's Flemish porter, 7 feet 6 inches; C. Munster, a yeoman of the guard in Hanover, who died in 1676, 8 feet 6 inches high; Cajanus, a Swedish giant, about 9 feet high, exhibited in London in 1742; C. Byrne, who died in 1783, attained the height of 8 feet 4 inches; Patrick Cotter O'Brien, who lived about the same time, was 8 feet 7¾ inches; a Swede in the celebrated grenadier guard of Frederick William I of Prussia stood 8½ feet. In 1844 died Pauline Wedde (called Marian), over 8 feet 2 inches at the age of eighteen. One of the highest on record is the Austrian giant Josef Winkelmaier (1865-1887), whose height was 8 feet 9 inches. As a rule, giants are comparatively feeble in body and mind, and are short-lived. Gigantic stature is generally accompanied by a want of proportion in parts, some parts growing too quickly for others, or continuing to grow after the others have ceased. The relation between the upper and lower half of the body is not disturbed; but the skull, brain, and forehead are relatively small, the jaws very large, the shoulders, breast, and haunches very broad, and the muscular system comparatively weak. Some giants are affected with the disease called acromegaly, an ailment of the pos-

terior half of the pituitary body, a small, ductless gland situated at the base of the brain, in the sella turcica, a saddle-shaped space in the sphenoid bone. In these the hands, head, and feet are especially enlarged.

Giant's Causeway (jī'antz kąz'wā), an extensive and extraordinary assemblage of polygonal basaltic columns on the north coast of Ireland, in the County of Antrim, between Bengore Head and Port Rush. The name is sometimes given to the whole range of basalt cliffs along the coast, some of which reach the height of 400 or 500 feet; but it is more properly restricted to a small portion of it where a platform of closely-arranged basalt columns from 15 to 36 feet in height runs down into the sea in three divisions, known as the Little, the Middle, and the Grand Causeway. The last is from 20 to 30 feet wide, and stretches some 900 feet into the sea. The Giant's Causeway derives its name from the legend that it was built by giants as a road which was to stretch across the sea to Scotland. There are similar formations on the west coast of Scotland, on the island of Staffa.

Giant's Kettles, a name given in Norway to vertical, pot-shaped, smooth hollows excavated in rocks, usually filled up with stones, gravel, etc. They were probably formed by water from the ice of the glacial period, descending through *moulins* or glacial chimneys and setting stones and boulders in rapid rotation. The pot-holes found in the beds of rapid streams and near waterfalls had a similar origin.

Giaour (jour), a Turkish word from Persian *gawr*, an infidel, used by the Turks to designate the adherents of all religions except Mohammedan, more particularly Christians. The use of it is so common that it is often applied without intending an insult.

Giarre (ji-är'rā), a Sicilian town near the coast, in the province of Catania. In the neighborhood are what is left of the famous chestnut trees of Ætna. Pop. 26,194.

Gibbon (gib'un), a name common to the apes of the genus *Hylobătes*, but more particularly restricted to the species *Hylobătes lar*, which inhabits the islands of the Indian Archipelago. It is distinguished from other quadrumanous animals by the slenderness of its form, but more particularly by the extraordinary length of its arms, which, when the animal is standing, reach nearly to the ankles, and which enables it to swing itself from tree to tree with wonderful agility. Its color is black, but its face is commonly surrounded with a white or gray beard. There are various other species, and the gibbons are classed among the anthropoid apes, and can stand erect with more ease than the orang or gorilla, their long arms aiding them to maintain the erect attitude, though they cannot walk with ease.

Gibbon, EDWARD, an eminent English historian, was born at Putney in Surrey in 1737. He was the son of a gentleman of an ancient Kentish family. He entered Magdalen College, Oxford, where he remained fourteen months. Having declared himself a Roman Catholic, his father placed him under the care of M. Pavillard, a learned Calvinistic minister at Lausanne, by whom he was reconverted to the Protestant faith. His residence at Lausanne was highly favorable to his progress in knowledge and the formation of regular habits of study. The belles-lettres and the history of the human mind chiefly occupied his attention. In 1758 he returned to England, and immediately began to lay the foundation of a copious library; and soon after composed in the French language his *Essai sur l'Etude de la Littérature* (1761). In 1763 he visited Paris and Lausanne, and he journeyed in Italy during 1764. It was here that the idea of writing his great history occurred to him as he sat musing among the ruins of the capitol at Rome, while the barefooted friars were singing vespers in the Temple of Jupiter. In 1770 he published a pamphlet entitled *Critical Observations on the Sixth Book of the Æneid.* In 1774 he obtained a seat in Parliament for Liskeard, and was a silent supporter of the North administration and its American politics for eight years. In 1776 the first quarto volume of his *Decline and Fall of the Roman Empire* was published, and at once made a public reputation for its author. In 1778 he drew up on behalf of the English government a *Mémoire Justificatif* in answer to the manifesto of the French court, and for this service he was made one of the lords of trade. On the retirement of North he lost his appointment, and soon after withdrew to Lausanne (1783), where, in the course of four years, he completed the three remaining volumes of his history, which were published together in 1788. In 1793 he returned to England, where he died in 1794.

Gibbon, JOHN, soldier, born in Pennsylvania in 1826. He graduated at West Point in 1847, became captain in 1859; took part in the Civil war, commanding a brigade at Antietam and

Gettysburg, and serving as major-general in Grant's Wilderness-Richmond campaign. He was breveted major-general in the regular army in 1865, promoted brigadier-general in 1886, retired in 1891, and died in 1896.

Gibbons, James, a cardinal of the Roman Catholic Church, was born at Baltimore in 1834. He was ordained a priest in 1861; made bishop of North Carolina in 1868, and of Richmond in 1872; archbishop of Baltimore in 1877, and created cardinal in 1886. As an author he is best known by *The Faith of Our Fathers*. He died in 1921.

Gibbons, Orlando, an English musical composer, born in 1583; died in 1625. At the age of twenty-one he was appointed organist of the Chapel Royal, and in 1622 he received the degree of Doctor of Music from the University of Oxford. Three years later he died of smallpox at Canterbury, where he had gone to be present at the marriage of Charles I with Henrietta of France. He was buried in Canterbury Cathedral, where his wife caused a magnificent tomb to be erected to him. He is the author of *Madrigals and Anthems* ('Hosanna to the Son of David!' 'Almighty and Everlasting God!' etc.).

Gibbs, Oliver Wolcott, an American chemist (1822-1908), born in New York City. He was professor of physics and chemistry in the College of the City of New York, 1849-63, and Rumford professor of chemistry in Harvard University, 1863-87. He was one of the contributing editors of the *American Journal of Science*. His chemical researches in analytical and inorganic chemistry were of great value. The Wolcott Gibbs Laboratory at Harvard is named for him.

Gibel (jib'el), a fish of the carp genus, *Cyprinus gibelio*, generally known in England as the Prussian carp, and belonging to that section of the genus having no barbules at the mouth. It is a good table fish, but seldom weighs more than ½ lb. It is said to be able to live so much as thirty hours out of water.

Gibeon (ghib'e-on), one of the ancient royal cities of the Canaanites, a 'great city' of the Hivites, who at an early stage of Joshua's conquests, by disguising themselves in old clothes and professing to come from a far country, obtained an alliance and covenant with the Israelites. When the stratagem was discovered, the Israelites resolved to observe the covenant, but condemned them to be 'hewers of wood and drawers of water unto all the congregation' (Jos., ix, 21). It was during the battle here between Joshua and the five kings of the Amorites that the sun 'stood still upon Gibeon, and the moon in the valley of Ajalon.' Gibeon has been identified with the modern El-Jib.

Gibraltar (jib-ral'tar), a town and strongly-fortified rocky peninsula near the southern extremity of Spain, a military stronghold of Great Britain. It is connected with the mainland by a low, sandy isthmus, 1½ miles long and ¾ mile broad, known as the 'neutral ground,' and has Gibraltar Bay on the west, the open sea on the east and south. The highest point of the rock is about 1400 feet above sea-level; its north face is almost perpendicular, while its east side exhibits tremendous precipices. On its south side it is almost inaccessible, making approach from seaward impossible; the west side, again, although very rugged and precipitous, slopes towards the sea; and here the rock is secured by extensive and powerful batteries, rendering it apparently impregnable. Vast sums of money and an immense amount of labor have been spent in fortifying this celebrated stronghold, which, as a coaling station, depôt for war material, and a port of refuge in case of war, would form one of the most important points of support for British naval operations and British commerce eastwards. Numerous caverns and galleries, extending 2 to 3 miles in length, and of sufficient width for carriages, have been cut in the solid rock, with port-holes at intervals of every 12 yards bearing upon the neutral ground and the bay, and mounted with more than 1000 guns, some of them of the largest size. The garrison numbers about 5000. The town of Gibraltar is situated on the west side of the peninsula, terminating in Europa Point, and thus fronts the bay. It consists chiefly of one spacious street about ½ mile in length, lined with shops, and paved and lighted. Its water supply is derived from the rainfall. Gibraltar is a free port, and has a considerable shipping trade, being an entrepôt for the distribution of British manufactures. The chief export is wine. The civil population amounts to about 22,000.

—Gibraltar, known to the Greeks as Calpe, was first fortified as a strategic point by the Saracen leader Tarik Ibn Zeiad in 711-12, from whom it was thenceforward called Gebel-al-Tarik, the rock of Tarik. It was ultimately taken by the Spaniards from the Moors in 1462, fortified in the European style, and so much strengthened that the engineers of the seventeenth century considered it impregnable. It was taken, however, after a vigorous bombardment in 1704

by a combined English and Dutch force under Sir George Rooke and Prince George of Darmstadt, and was secured to Britain by the Peace of Utrecht in 1713. Since then it has remained in British hands, notwithstanding some desperate efforts on the part of Spain and France to retake it. In 1704-5 it was closely besieged; in 1727 it was hard pressed by a Spanish force when Admiral Wager, with eleven ships of the line, relieved it. In 1779, Britain being then engaged in a war with its revolted colonies and with France, a last grand effort was made by Spain to recover Gibraltar. The siege lasted for nearly four years, the fire being for the great part of that time very harassing, and rising on several occasions into a fierce and prolonged bombardment. It was heroically and successfully defended, however, by General Elliot (afterwards Lord Heathfield) and the garrison. Since that time, in the various British and Spanish, and also French wars, Gibraltar has only been blockaded on the land side.

Gibraltar, STRAITS OF, the channel which forms an entrance from the Atlantic into the Mediterranean. The narrowest part is a little to the west of Gibraltar, and 15 miles across. A strong and constant current flows into the Mediterranean from the Atlantic Ocean, in the middle of the Straits, but the undercurrent as well as two feeble lateral currents along the coast set towards the ocean.

Gibson (gib'son), CHARLES DANA, artist, born at Roxbury, Massachusetts, in 1867. He studied art in New York and Paris, and became a successful instructor and society cartoonist in New York. The 'Gibson girl' an American type, was created by him. He wrote *People of Dickens, Sketches and Cartoons, A Widow and her Friends, The Social Ladder*, etc.

Gibson, JOHN, one of the most distinguished English sculptors of modern times, born near Conway, in Wales, in 1790; died at Rome in 1866. He was the son of a landscape-gardener, and was apprenticed to a woodcarver at Liverpool, where he attracted attention by a figure of *Time* modeled in wax which he exhibited at the age of eighteen. The patronage of Mr. W. Roscoe assisted him to go to Rome, where he was cordially received by Canova. On the death of Canova in 1822, Gibson entered the studio of Thorwaldsen. His reputation was now widely spread, and his works were eagerly sought after by his countrymen. In 1836 he was made a Royal Academician; but to the end of his life he continued to make Rome his chief place of residence. Most of Gibson's subjects are taken from classical mythology, and are executed with a noble severity and purity of style. Among his best works are: *The Wounded Amazon; The Hunter and His Dog; Hylas and the Nymphs, Helen, Proserpine, Sappho,* and others. One of his peculiarities as an artist was the practice of coloring his statues.

Giddings (gid'ings), FRANKLIN HENRY, sociologist, born at Sherman, Connecticut, in 1855. He engaged in journalism and afterwards became a professor of and lecturer in sociology. Has held this chair in Columbia University since 1894. He wrote *The Theory of Sociology, The Principles of Sociology,* and other works on this subject.

Giddings, JOSHUA REED, statesman, was born at Athens, Pennsylvania, 1795; died in 1864. Successfully practicing as a lawyer, in 1839, he was elected to congress, serving for twenty years. An advocate of the abolition of slavery in the territories, he seized every opportunity to aid in the formation of a public sentiment hostile to its further extension. His life was often threatened, and twice he was assaulted by armed men on the floor of the House, and once mobbed in Washington. For antislavery resolutions introduced by him he was censured by vote of the House. He was a forcible speaker and able writer.

Giers (gērz), NICHOLAS CARLOVITCH DE, a Russian statesman descended from a Swedish family settled in Finland, was born in 1820. After holding various posts, in 1875 he became adjunct to Prince Gortschakoff, the minister of foreign affairs, whom he succeeded in 1882. His policy in general was understood to be of peaceful tendencies, and in particular opposed to Panslavistic ideas of development. In Central Asia, however, he continued the policy of advance, and in 1885 the Russian occupation of positions within the Afghan frontier nearly brought about a war with Britain. He died in 1895.

Giessen (gē'sĕn), a town of Germany, capital of the province of Upper Hesse, in the Grand-duchy of Hesse-Darmstadt, on the Lahn. It was once fortified, and is still entered by four gates, but its ramparts have been converted into pleasant walks. It has a castle, now converted into government offices, and a university founded in 1607, and possessing valuable apparatus, an observatory, and a botanical garden. Pop. 31,153.

Gifford (gif'ord), Robert Swain, artist, born at Goswald, Massachusetts, in 1840, the son of a poor boatman. He traveled extensively in the interest of art and became one of the leading American landscape painters, and was also distinguished as an etcher and art instructor. He died in 1905.

Gifford, Sandford Robinson, painter, born at Greenfield, New York, in 1823; died in 1880. He developed a versatile talent as an artist, his main attention being given to landscapes. Among his noted works are *Coming Storm, Waves Breaking on the Beach,* and *Morning in the Mountains.*

Gifford, William, a critic and satirist, born at Ashburton, Devonshire, in 1757. He was apprenticed to a shoemaker, but possessing a strong taste for study he was enabled by the kindness of some friends to go to school and afterwards to Oxford University. After being some time tutor in Earl Grosvenor's family he published in 1794, *The Bæviad,* a satire directed against the poetasters of the Della Crusca school; and in 1795 *The Mæviad,* a severe satire on the contemporary drama. In 1797 he became editor of the *Anti-Jacobin;* and he published a translation of Juvenal in 1802. On the foundation of the *Quarterly Review in* 1809, he became its editor, conducting it with much ability. He also edited the works of Massinger, Ford, Jonson, and Shirley. He died in 1826, and was interred in Westminster Abbey.

Gifford Lectures, lectureships endowed by Lord Gifford, one of the judges of the Court of Session, Edinburgh, from 1870 to 1881, who left £80,000 for the purpose. They were founded in connection with the Universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews, and are for the exposition of natural religion in the widest sense of that term; the lecturers to be subjected to no test of any kind; to belong to any denomination whatever, or to no denomination. The appointments are for two years, but may be held for six. The lecturers were to deliver a yearly course of about twenty original lectures open to all. The first lecturers were: Glasgow, Max Müller; Edinburgh, Hutchinson Stirling; St. Andrews, Andrew Lang; and Aberdeen, E. B. Tylor.

Gijon (*hē-hōn'*), a seaport in Spain, on the Bay of Biscay. It consists of an old and a new town, the former on the upper part of a slope and the latter below. It contains a cigar manufactory, employing about 1400 persons, and has various other industries and a good trade. Pop. 52,226.

Gila (jē'lä), Rio, a North American river, which rises in New Mexico and flows westward for 450 miles, and then unites with the Colorado. Curious ruins of stone-built houses occur all along its banks. In these are found fragments of pottery.

Gila Monster (*Heloderma suspectum*), a poisonous lizard of the desert region of the Southwest United States. It is one of the largest lizards of the continent, and has scales of brilliant orange and jet black. Its bite is fatal to small mammals and birds and very injurious to man, though seldom fatal. *H. horridum,* of Mexico, is similarly poisonous.

Gilbert (gil'bert), Sir Humphrey, an English navigator of the reign of Queen Elizabeth, born in Devonshire about 1539. In 1578 he obtained from the queen a patent, empowering him to discover and colonize in North America any land then unsettled, and made an unsuccessful voyage to Newfoundland. In 1583 he sailed to it again, and took possession of the harbor of St. John's. On his return home he embarked in a small vessel and was lost in a storm.

Gilbert, Sir John, an English painter, born in 1817. He first exhibited in 1836. His first notable work was *The Arrest of Lord Hastings by the Protector Richard, Duke of Gloucester,* in water-color. He has also painted in oil, and among his more notable productions in that branch of the art are *Don Quixote giving Advice to Sancho Panza, The Education of Gil Blas,* and a series of tableaux of the principal character in Shakespere. He possessed especial merit in depicting old English scenes. He was the most prominent artist engaged on the *Illustrated London News* for a number of years after its commencement in 1842, and during the same period did a great amount of book illustration. In 1871 he became president of the Society of Water-Colors. In the same year he was knighted, and in 1872 he became an R.A., becoming R.A. in 1876. He died in 1897.

Gilbert, John Gibbs, actor, born at Boston, Massachusetts, in 1810; died in 1897. After acting four years in the United States and England, he joined Wallack's company in New York in 1862. He was highly popular in old men characters, such as *Sir Peter Teazle, Sir Anthony Absolute, Old Dornton,* etc.

Gilbert, John S., naval architect, was born in Connecticut in 1801; died in 1891. He invented the balance drydock now used at all im

portant seaports, and built some of the largest drydocks in the United States. For several years he was in the service of the Austrian government, and declined tempting offers from Russia on account of age.

Gilbert, WILLIAM SCHWENK, an English dramatist, born in London in 1836. In 1857 he became a clerk in the Education Office, and in 1862 was called to the bar, but has devoted his time since then almost exclusively to literature. In 1875 he entered into partnership with Arthur Sullivan, the composer, and in conjunction with him produced a series of comic operas, *Trial by Jury* (1876), *Pinafore* (1878), *The Pirates of Penzance* (1880), *Patience* (1882), *Iolanthe* (1883), *Princess Ida* (1884), *The Mikado* (1885), etc. Died by drowning, May 29, 1911.

Gilbertine Order (gil'ber-tēn), an order of canons founded in England by Gilbert of Sempringham in the twelfth century. They followed the Augustinian rule, and their numerous monasteries were suppressed by Henry VIII. There was also a Gilbertine order of nuns.

Gilbert Islands, or KINGSMILL GROUP, a group of sixteen islands in the Pacific Ocean, on the equator, between lon. 172° 0′ and 174° 30′ E. Area about 170 sq. miles. They are of coral formation, and all low and not fertile. Their chief products are mostly the cocoanut, pandanus, taro, and the breadfruit tree. The islanders differ from the Polynesians, and more nearly resemble the Malays. The women are much smaller in proportion than the men, with delicate features and slight figures. Pop. of the group 40,000, of whom a certain number are Christians. They were annexed by the British government in 1892.

Gilberton, a borough in Schuylkill County, Pennsylvania, 4 miles from Mahanoy City; a mining town and the railroad center for all coal mined in the Mahanoy and Shenandoah Valleys. Pop. 5401.

Gilboa (gil-bō'a; Hebrew, 'Bubbling Fountain'), a range of hills in Palestine, bounding the plain of Esdraëlon on the N. E. One of them is identified with the ancient Gilboa, the scene of Saul's last fatal battle (I Sam., xxix, 1).

Gildas (gil'das) THE WISE (SAPIENS), a British ecclesiastic and historian of the sixth century, of whom little is known. There is extant a Latin treatise or diatribe ascribed to Gildas which bears the title of *Epistola de Excidio Britanniæ* ('On the Destruction of Britain'), but the violent invective which it employs against the Britons has led to doubts respecting its authenticity.

Gilder (gil'der), RICHARD WATSON, editor and author, born at Bordentown, New Jersey, in 1844. He engaged in railroad work, established the *Newark Register*, in 1870 became managing editor of *Scribner's Magazine*, and in 1881 editor-in-chief of *The Century*. He published *Five Books of Song*, *For the Country*, *In Palestine and Other Poems*, etc. He died in 1909.

Gilder, WILLIAM HENRY, Arctic explorer, brother of the preceding, was born at Philadelphia in 1838, died in 1900. He took part in the Franklin Search Expedition of 1878-80, and the De Long Arctic Expedition of 1881. After the disaster to the latter he made a winter journey of two thousand miles through Siberia to the nearest telegraph station, and took part in the search in the Lena delta for De Long and his companions. He wrote *Schwatka's Search* and *Ice Pack and Tundra*.

Gilding (gild'ing) is the art of applying gold-leaf or gold in a finely-divided state to surfaces of wood, stone, or metals, a very ancient art, it having been practiced among the Egyptians, Greeks, Romans, and ancient Persians. The processes employed at the present day are very varied. Metals are gilded either by what is called chemical gilding, mercurial gilding, electrogilding (see *Electrometallurgy*), or by the application of gold-leaf. Copper and brass, for instance, may be gilded by the process called *wash* or *water gilding*, with an amalgam of gold and mercury. The surface of the copper, freed from oxide, is covered with the amalgam, and afterwards exposed to heat till the mercury is driven off, leaving a thin coat of gold. Gilding is also performed by dipping a linen rag in a saturated solution of gold, and burning it to tinder, the black powder thus obtained being rubbed on the metal to be gilded, with a cork dipped in salt water, till the gilding appears. Iron or steel is often gilded by applying gold-leaf, after the surface has been well cleaned, and heated until it has acquired the blue color which at a certain temperature it assumes. Several leaves of gold are thus applied in succession, and the last is burnished down cold. One process of chemical gilding is by dipping the article into a solution of gold, what is termed Elkington's solution being composed as follows:—5 oz. (troy) of fine gold; nitrohydrochloric acid, 52 oz. (avoir-

dupois); dissolve by heat, and continue the heat until the cessation of red or yellow vapors; decant the clear liquid; add 4 gals. of distilled water, pure bicarbonate of potassium 20 lbs., and boil for two hours. Gilding on wood, plaster, leather, parchment, or paper is performed by different processes of mechanical gilding. The first of these is oil-gilding, in which gold-leaf is cemented to the work by means of oil-size. In the case of paper or vellum the parts to be gilt receive a coat of gum-water or fine size, and the gold-leaf is applied before the parts are dry. They are afterwards burnished with agate. Lettering and other gilding on bound books are applied without size. The gold-leaf is laid on the leather and imprinted with hot brass types. Brass rollers with thin edges are employed in the same way for lines, and similar tools for other ornaments. When the edges of the leaves of books are to be gilt they are first cut smooth in the press, after which a solution of isinglass in spirits is laid on, and the gold-leaf is applied when the edges are in a proper state of dryness. Japaner's gilding is another kind of mechanical gilding, which is performed in the same way as oil-gilding, except that instead of gold-leaf a gold dust or powder is employed. Frames of pictures and mirrors, moldings, etc., are gilt by the application of gold-leaf, or by the cheaper process of 'German gilding,' that is, by tin-foil or silver-leaf, with a yellow varnish above. Porcelain and other kinds of earthenware, as well as glass, may be gilt by fixing a layer of gold in a powdered state by the action of fire. The gold-dust or powder required in this operation may be obtained by precipitating it from a solution in aqua regia, either by means of sulphate of iron or protonitrate of mercury. In order that the gold powder may be applied to the surface of the article to be gilt it must be well mixed with some viscous vehicle, such as strongly-gummed water. It is then laid on with a fine camel-hair brush.

Gilead (gil'ē-ud), a mountain region on the east of Palestine, having Bashan on the north and Moab and Ammon on the south. It was noted for its balm, as well as for its pasturage.

Giles (jīlz), St. (*St. Ægidius*), a native of Greece, who, according to the legend, lived in the sixth century, and was descended from an illustrious family. He is said to have worked miracles, and founded a convent in France. He became patron saint of Edinburgh. His festival falls on the 1st of September.

Giles, St., name of a parish in London, with which is incorporated that of St. George, Bloomsbury, both in the borough of Finsbury. The wretchedness of St. Giles is often contrasted with the luxury of St. James in London.

Gilfillan (gil-fil'an), George, a British author, born in 1813; died in 1878. He became a licentiate of the Secession (Presbyterian) Church, and in 1836 was ordained to the School Wynd Church, Dundee. His numerous writings, among which may be mentioned *A Gallery of Literary Portraits*, and *The Bards of the Bible*, possess a vigorous style and great powers of fancy.

Gilfillan, Robert, a Scottish poet, born in Dunfermline in 1798; died in 1850. He learned to be a cooper, and after trying one or two other trades he was latterly collector of police rates in Leith. In 1831 he published a small volume entitled *Original Songs*.

Gilghit, or Gilgit (gil'git), a valley and district in Cashmere, situated on the southern slope of the Hindu Kūsh, and watered by the Gilgit, or Yasm, a tributary of the Indus.

Gill (jil), a measure of capacity equal to ¼ of a pint, and $\frac{1}{32}$ of a gallon.

Gill (gil), David, astronomer, born in Aberdeenshire in 1843. He became in 1879 royal astronomer at the Cape of Good Hope. He organized expeditions to observe two transits of Venus, and in 1885 began a photographic survey of the southern heavens, making a catalogue in 1895 of 450,000 stars. His publications have been valuable and numerous.

Gill, Theodore Nicholas, ichthyologist, born in New York in 1837. After many years' connection with the Smithsonian Institution, he became professor of zoology at Columbian University, now George Washington University, in 1884. He has published numerous papers on fishes and has given attention to other departments of zoology.

Gilles (zhēl), St., a town in Southern France, dep. Gard, a country rich in vineyards. Pop. 6381.

Gillette (gil'let), William Hooker, actor and dramatist, was born at Hartford, Connecticut, in 1857. He began a stage career in 1877, and after 1881 played in his own dramas. These include *The Professor, Held by the Enemy, Secret Service, Sherlock Holmes*, etc.

Gillies (gil'iz), John, a Scottish historian and scholar, born at Brechin in 1747; died at Clapham in

1836. He settled in London, where he applied himself to literature. He wrote a *History of Ancient Greece* and a *View of the Reign of Frederick II*, and translated a number of Greek works.

Gillray (gil-rā), JAMES, an English caricaturist, born about the middle of the eighteenth century; died in London in 1815. He caricatured the king (George III) and the members of the House of Lords and afterwards the French and the French celebrities of the day.

Gills (gils), the respiratory organs of animals which respire by obtaining oxygen from water, as crustaceans, molluscs, fishes and amphibians. In fishes they consist of cartilaginous or bony arches attached to the bones of the head, and furnished on the exterior convex side with a multitude of fleshy leaves or fringed vascular fibrils resembling plumes. The water is admitted by the gill-opening, and acts upon the blood as it circulates in the fibrils.

Gillyflower (jil'i-flou-ẽr), a name bestowed on such cruciferous flowers as the wallflower or carnation, etc. The clove-pink (*Dianthus Caryophyllus*) is termed clove gillyflower.

Gilman, CHARLOTTE PERKINS, an American author and lecturer, born at Hartford, Connecticut, July 3, 1860. Her books include *Women and Economics* (1898), *Concerning Children* (1900), *The Home, Its work and Influence* (1903), *The Man-Made World* (1910).

Gilman, DANIEL COIT, educator, born at Norwich, Connecticut, in 1831; died in 1908. He graduated at Yale in 1852, and was professor of geography there 1856-72; president of the University of California 1872-75. Elected the first president of Johns Hopkins University in 1875, he served there till 1901, and in 1902 was elected president of the Carnegie Institution. He was a member of the Venezuela boundary-line commission of 1896-97.

Gilmore, JAMES ROBERTS, author, born at Boston in 1832; died in 1903. He wrote, under the pen-name of Edmund Kirke, several novels of Southern life during the Civil war, and also wrote a number of historical works, including *The Rear-Guard of the Revolution, John Seveir as a Commonwealth Builder*, etc.

Gilolo, JILOLO (jē-lō'lō), an island in the Indian Archipelago, the largest of the Moluccas; area, 6500 square miles. It is of singular form, consisting of four peninsulas, radiating N., N. E., E. S. E., and S., from a common center, and having large bays between. It is rugged and mountainous, the mountains being volcanic. The principal productions are sago, cocoanuts, spices, edible birds'-nests, useful timber, etc.; horses, cattle, and sheep abound. Deer, wild boars, and other game are likewise plentiful. The original inhabitants, called Alfoories, have been gradually pressed into the interior by the Malays. The island is under Dutch rule and has a population of about 120,000.

Gil Polo. See *Polo.*

Gilthead (gilt'hed; *Chrysophrys aurāta*), an acanthopterygious fish of the Sparidæ or sea-bream family common in the Mediterranean. It has strong grinding teeth for crushing the shells of the molluscs on which it feeds; a yellow band stretches from eye to eye (whence its generic name, signifying 'golden eyebrows'). Its color is a mixture of silver and sky-blue, its dorsal and caudal fins are black, while brown lines pass along the sides. It is a fine fish, and sometimes reaches a weight of 18 to 20 lbs.

Gilt Toys, the trade term for trinkets of copper or German-silver, with a thin coating of gold or silver spread over its surface. Gilt toys are thus cheaper than gold and silver jewelry, but they may be equally brilliant and as little liable to tarnish. In Britain this industry is chiefly carried on at Birmingham; and in France at Paris and Lyons.

Gimbals (gim'balz), the name of the pair of rings within which the mariner's compass is slung, or any pair of similar rings. The gimbals maintain the compass-bowl and the compass-card in a horizontal position, there being two concentric rings, the outer turning about a horizontal axis, and the inner turning about a similar axis at right angles to the other. Ship chronometers are often suspended the same way.

Gimlet (gim'let), a small tool with a pointed screw at the end, used for boring holes in wood or other substances by turning. A larger instrument of this nature is termed an *auger*.

Gimp (gimp), a silk, woolen, or cotton twist stiffened by a fine wire, or sometimes a coarse thread running through it, and much used in trimmings for dresses, etc.

Gin (jin), a spirit distilled from grain, and flavored with juniper-berries, and sometimes with oil of turpentine and common salt, and with other substances. The name is from *genièvre*, the French for 'juniper.' It is largely

manufactured in Holland, particularly in Schiedam, and the gin thence imported is thus often called Schiedam as well as Hollands. In Great Britain gin is largely manufactured in London, where it often goes by the name of *Old Tom*, and to a less extent at Plymouth and Bristol. What is termed 'gin' in Great Britain differs materially from Hollands and even from the best English gin, as it is a plain corn spirit, which derives its flavor from oil of turpentine, with certain aromatics in small quantities.

Gin, the name of certain machines employed in raising weights. One form consists of three poles, 12 to 15 feet long, often tapering from the lower extremity to the top and united at their upper extremities, whence a block and tackle is suspended. A space of 8 or 9 ft. separates the lower extremities planted in the ground, and a kind of windlass is attached to two of the legs. Another kind of gin is a sort of whim or windlass for raising coal, etc. It is worked by a horse, which turns a cylinder, and winds on it a rope, by which the weight is raised. See *Cotton Gin.*

Gingal (jin'gal), a kind of large musket used in some parts of Asia. It is fired from a rest, and may be mounted on a light carriage.

Gingelly Oil (jin-jel'i). See *Benné Oil.*

Ginger (jin'ger; *Zingiber officināle*), an East Indian plant of the order Zingiberaceæ. It grows in moist places in various parts of tropical Asia and the Asiatic islands, and has been introduced into the West Indies, particularly Jamaica, as also into S. America and W. Africa. The kind most esteemed is Jamaica ginger. The rhizome, or underground stem, is what is used, being employed in various ways. It has an aromatic, pungent taste, and when young is candied, and makes an excellent preserve. It is a favorite condiment and is used medicinally as a carminative, stomachic, and in indigestion. It enters into the composition of a great number of confections, infusions, pills, etc. The special preparations are the *tincture* and the *essence* of ginger, and the *syrup*, prepared by mixing twenty-five parts of syrup with one of the strong tincture. *Infusion* of ginger is a preparation useful for flatulence.

Ginger Plant (*Zingiber officinale*).

Ginger-ale, an aërated water made in the same way as lemonade, but flavored with ginger instead of lemon.

Ginger-beer, a pleasant, non-alcoholic, effervescing beverage, made by mixing together ginger, cream of tartar, sugar, yeast, and water, and allowing the whole to ferment for a time, then bottling. Ginger-beer may also be prepared thus: Add to each gallon of water 1 lb. of refined sugar, and ½ oz. of ground ginger. Boil for an hour, add the white of two eggs, remove the scum. Strain into a vessel to cool, cask it up with the juice and peel of a lemon. Add a very small amount of brewer's yeast, and bung up tightly for a fortnight.

Gingerbread, a well-known cake made in many ways, the chief ingredients being flour and treacle, with butter, eggs, etc., and enough ginger to flavor it.

Ginger-cordial, or GINGER-WINE, a beverage made from raisins, lemon rind, ginger, sugar, and water, with some whisky or brandy.

Gingham (ging'am), a cotton fabric distinguished from calico by having the colors woven with the fabric, not printed on it. The patterns are various; sometimes fancy designs, sometimes checkered, and sometimes striped. Umbrella ginghams are all of one color.

Gingko (ging'kō), the Japanese name of coniferous trees of the genus *Salisburia* belonging to the yew family. The *Salisburia adiantifolia* is a tree which sometimes rises nearly 100 feet in height. It is destitute of resin. It is a native of China and Japan, and was introduced into Europe in 1754, when it was brought to England. Its fruit encloses a kernel which, when roasted, may be used as food, and which tastes like maize.

Ginsburg (gins'bürh), CHRISTIAN, a rabbinical scholar, born at Warsaw in 1830. He is the author of *Historical and Critical Commentary on the Song of Songs; The Karaites, their History and Literature; The Essenes; The Kabbalah, its Doctrines, Development, and Literature*, and other works of similar character. His greatest work is, however, the *Massora*. He was one of the scholars engaged on the revised version of the Old Testament.

Ginseng (jin'seng), a plant of Northern Asia, *Panax schinseng*, order Araliaceæ, herbaceous,

and about 1 foot high. Its root is regarded as a sort of panacea among the Chinese, and is largely imported, but it appears to be really of very little efficacy; the taste is sweet and mucilaginous, accompanied with some bitterness, and also slightly aromatic. Another species of

American Ginseng (*Panax quinquefolium*).

ginseng, *Panax quinquefolium*, inhabits Canada and the northeastern parts of the United States. Quantities of its root are sent to China.

Gioberti (jō-bėr'tē), VINCENZO, an Italian philosopher and statesman, born at Turin in 1801; died at Paris in 1852. Having been educated for the church, he was appointed chaplain to Charles Albert, King of Sardinia, but rendered himself obnoxious by his republican sentiments, and was first imprisoned, and, in 1833, banished. The first few years of his exile he spent at Paris, and afterwards became a teacher of philosophy in a school at Brussels. There he published two works, one of which was an attempt to reconcile philosophy and Roman Catholicism. In 1843 appeared his *Primato Morale e Civile degli Italiani*, a defence on liberal principles of the papacy, a work which brought over the majority of the priests to the national party. In 1847 he published a work entitled *Il Gesuita Moderno* ('The Modern Jesuit'). When Charles Albert in 1848 granted a constitution to Sardinia, Gioberti returned to his native country, but he soon after withdrew to Paris.

Giobertine Tincture (jō-bėr'tin), a preparation for restoring illegible writings or faded pictures. The inventor of it was Giovanni Antonio Gioberti (1761-1824), a native of Piedmont.

Gioja Del Colle (jō'yȧ del kol'lā), a town in Southern Italy, province of Bari, on a slope of the Apennines. Pop. 21,721.

Giordano (jor-dä'nō), LUCA, an Italian painter, born at Naples about 1632, a scholar of Spagnoletto, studied the great Italian masters at Rome, and became the pupil of Peter of Cortona. Paul Veronese had afterwards great influence on his manner. He imitated the greatest masters so well that even connoisseurs were imposed upon. In 1679 he was employed by Charles II to ornament the Escurial, and at the court of Spain he became a great favorite. Giordano was especially successful in imitating the manner of Bassano, and of the Chevalier Massimo Stanzioni. After the death of Charles II he returned to his native country, where he died about 1705. His most celebrated pieces are his frescoes, in the Escurial, at Madrid, Florence, and Rome. Some of his finest paintings are at Dresden.

Giorgione (jor-jō'nā), properly GIORGIO BARBARELLI, born in 1477 at Castelfranco, one of the most celebrated painters of the Venetian school. In Venice he ornamented the façades of several large buildings with frescoes, which have mostly perished. He found in Titian a formidable rival in this branch of his art. His portraits are reckoned among the finest of the Italian school. His pieces are rare, but some are to be seen at Milan, and in the galleries at Vienna and Dresden. He died in 1511.

Giotto (jot'tō), properly AMBROGIOTTO or ANGIOLOTTO BONDONE, a celebrated Italian painter. He was born probably about 1276, at the Florentine village of Vespignano, and in his boyhood tended cattle. But having been seen by Cimabue, as he was drawing figures of his sheep upon a piece of slate, that artist carried him to Florence and taught him painting. His natural talent and gracefulness developed so rapidly that he soon surpassed all his contemporaries. He represented human figures with truth and nature, and surpassed all others in the dignity and pleasing arrangement of his figures, and a regard to the proportions and disposition of the drapery. His figures have more life and freedom than those of Cimabue, as he particularly avoided the stiff style. Among his most celebrated pieces is the *Navicella* (ship), at Rome (a picture of 'Peter Walking Upon the Waves'), some fresco paintings at Florence, also the history of St. Francis, at Assisi, and several miniatures. He was equally successful as a statuary and as an architect. He died in 1336.

Giovinazzo (jō-vē-nȧt'sō), a seaport of South Italy, province of Bari, on the Adriatic, the seat of a bishop. Pop. 11,617.

Gipsy. See *Gypsies*.

Giraffe (ji-raf'; *Camelopardălis giraffa*), a ruminant animal inhabiting Africa, and constituting the only species of its genus and family. It is the tallest of all animals, a full-grown male reaching the height of 18 or 20 feet.

Giraffe (*Camelopardalis giraffa*)

This great stature is mainly due to the extraordinary length of the neck, in which, however, there are but seven vertebræ, though these are extremely elongated. It has two bony excrescences on its head resembling horns. Its great height is admirably suited with its habit of feeding on the leaves of trees, and in this the animal is further aided by its tongue, which is both prehensile and capable of being remarkably elongated or

Five-Horned Giraffe, showing Mizzen Horns.

contracted at will. When it browses the herbage on the ground it stretches out its forelegs as wide as possible till it can reach the ground by means of its long neck. Its color is usually light fawn, marked with darker spots. It is a mild and inoffensive animal, and in captivity is very gentle and playful. The giraffe is a native of a great part of Africa, from Abyssinia and Sennar to Senegal and the regions adjacent to the Cape Colony.

Giraldus Cambrensis (je-ral'dus kam-bren'-sĕs), an early English historian, born about 1146. His proper name was Gerald de Barry, and he was son of William de Barry, a Norman noble of Pembrokeshire. He was educated under his uncle, the Bishop of St. David's, and afterwards at the University of Paris. He returned in 1172, and was appointed archdeacon of St. David's. His uncle dying soon after, Gerald was elected to succeed him, but the king refused to confirm the appointment, and Gerald withdrew to Paris, where he was appointed professor of canon law. In the following year (1180) he returned to England, where he was required to administer the bishopric of St. David's, the proper bishop having proved himself incompetent. He discharged this office for four years, and was then appointed a royal chaplain. As companion to the king's son, Prince John, he went to Ireland in 1185, where he collected the materials for his Topography of Ireland (*Topographia Hiberniæ*). He afterwards drew up a similar work on Wales (*Itinerarium Cambriæ*). When he died is uncertain.

Girard (ji-rard'), Stephen, plutocrat and philanthropist, was born near Bordeaux, France, in 1750. In 1769 he established himself in business in Philadelphia, and in 1782 laid the foundation of a great fortune in the West India trade. In the war of 1812 he was the financial mainstay of the United States government, at one time advancing $5,000,000. At his death, in 1831, his property amounted to $9,000,000, a sum considered very large at that time, and the bulk of which was left for charitable purposes. The celebrated Girard College, at Philadelphia, was founded by him, costing $2,000,000, an institution for the education of orphan boys, between the ages of six and fourteen. It has proved one of the most successful and useful of charitable institutions.

Girard, a village of Trumbull Co., Ohio, on Mahoning River, 5 miles N. of Youngstown, in a coal and iron region, with steel mills, chewing gum factories, etc. Pop. (1920) 6556.

Girardin (zhē-rär-dan), Emile de, a French journalist and politician, born in 1802. A controversy in *La Presse*, which he founded, led to a duel between Girardin and Armand Carrel,

which proved fatal to the latter. In politics Girardin played many parts. He was fined 5000 francs in 1867 for attacks on the imperial government in *La Liberté.* He wrote numerous political pamphlets, and a few pieces for the stage. He died in 1881.—His first wife, Delphine Gay, daughter of the novelist Madame Sophie Gay, was a well-known authoress; born 1804; died 1855. She wrote the novels *Le Lorgnon, Le Marquis de Pontanges, La Canne de M. de Balzac, Il ne faut pas jouer avec Douleur,* and *Marguerite;* contributed to the *Presse* newspaper, and wrote for the stage *Lady Tartuffe* and *La Joie fait peur,* and other pieces.

Girasol (jĭ'ra-sōl), a precious opaline stone, which, under strong lights, reflects a brilliant reddish light. It is usually of a milk-white or bluish-white color. The brightest are brought from Brazil and Siberia. The name is sometimes bestowed on the Asteria sapphire. One variety is known as the fine opal.

Girder (gir'dẽr), a main beam, either of wood or iron, resting upon a wall or pier at each end, employed for supporting a superstructure, or a superincumbent weight, as a floor, the upper wall of a house when the lower part is sustained by pillars, the roadway of a bridge, and the like. Wooden girders are sometimes cut in two longitudinally and an iron plate inserted between the pieces, and the whole bolted together. This species of girder is called a *sandwich-girder.* For bridges cast-iron girders are sometimes cast in lengths of 40 feet and upwards, but when the span to be crossed is much greater than 40 feet, recourse is had to wrought-iron, or to *trussed, lattice,* or *box girders,* and cast-iron is now little used. A *trussed-girder* is a wooden girder strengthened with iron. A *lattice-girder* is a girder consisting of two horizontal beams united by diagonal crossing bars, somewhat resembling wooden latticework. A *box-girder* is a kind of girder resembling a large box, such as those employed in tubular bridges. There are also *bowstring-girders,* which are varieties of the lattice-girder, and consist of an arched beam, a horizontal tie resisting tension and holding together the ends of the arched rib, a series of vertical suspending bars by which the platform is hung from the arched rib, and a series of diagonal braces between the suspending bars.

Girdle of Venus (*Cestum Veneris*), an animal belonging to the actinozoa, found in the Mediterranean. In shape it resembles a ribbon, and it is apparently propelled by the cilia which fringe its edge. The mouth is situated on the inferior edge. It is iridescent by day, and brilliantly phosphorescent at night.

Girgeh (jir'je), a town, formerly capital, of Upper Egypt, on the left bank of the Nile. It possesses a Roman Catholic convent, the oldest in Egypt. Pop. 19,893.

Girgenti (jir-jen'tē), a town in the southwest of Sicily, capital of the province of same name, 58 miles S. S. E. of Palermo, a few miles from the sea, on an elevated site, with a cathedral, library, museum, etc. It exports wheat, oil, fruit, and sulphur, its port being Porto Empedocle. Near the town are the extensive and remarkable ruins of the ancient Agrigentum. Pop. 25,024.—The province has an area of 1490 square miles, and is rather mountainous in character. Pop. 371,638.

Girodet-Trioson (zhē-ro-dā-trē-o-sōn), ANNE LOUIS GIRODET DE ROUSSY, a French historical painter, born in 1767; died in 1824. Among his famous pictures are *Endymion, Hippocrates, The Deluge, Atala, Napoleon Receiving the Keys of Vienna,* and *St. Louis in Egypt.*

Gironde (zhē-rōnd), a department of France, on the Bay of Biscay, named from the Gironde estuary; area, 3160 square miles. The surface is generally flat, and almost the whole department belongs to the basin of the Gironde, which is formed by the junction of the Dordogne and Garonne. The climate is generally mild and extremely moist. One-third of the surface is waste, and about one-fourth is arable land. The staple production is wine, Médoc, Graves, Côtes, and Entre-deux-Mers being the most celebrated growths. (See *Bordelais Wines.*) The forests of oak and pine are extensive. The minerals are unimportant, but much salt is obtained from lagoons. The manufactures are varied; the trade, which has its center at Bordeaux, is very important. Bordeaux is the capital. Pop. (1906) 823,925.

Gironde, RIVER. See *Garonne.*

Girondists (zhē-rōnd-ists), GIRONDINS, one of the great political parties of the first French revolution. The Girondists were republicans, but were more distinguished for visionary ideals than for a well-defined policy; hence they fell an easy prey to the party of the Mountain. Their leaders were three of the deputies of the Gironde—Verginaud, Guadet, and Gensonné, hence the name. Louis XVI was obliged, in 1792, to select a ministry from among

the Girondists, but it was short-lived. In the convention their struggles with the Montagnards forced them into extreme measures which they would otherwise have avoided. They wished to save the king, but many of them, from a mistaken policy, voted for his death. Their fall dates from their unsuccessful impeachment of Marat (1793), soon after which a large number of them were proscribed, and twenty-one executed.

Girton College, Cambridge, the most noted college for women in England. Opened in 1869 at Hitchin, it was removed to Girton, and opened in 1873. Newnham Hall, Cambridge (opened 1875), is also connected with it.

Girvan (gir'van), a seaport of Scotland, county of Ayr, situated at the head of a fine bay, on the Girvan. The winter herring fishery is the most important industry. Pop. 4024.

Gisors (zhē-sōr), a town of Northern France, department of Eure, with a well-preserved castle of the twelfth century. Pop. (1906) 4345.

Gissing (gis'ing), GEORGE ROBERT, novelist, born at Wakefield, England, in 1857; died in 1904. He made a close and accurate study of the London populace, and wrote a large number of novels, somber but strong life-pictures.

Gitschin (gich'in), a walled town of Northeastern Bohemia, in a fine valley, on the Cidlina. It has a castle built by Wallenstein, whose residence it was. Pop. 10,000.

Giulio Romano (jō'lē-ō rō-mä'nō), or GIULIO PIPPI, an Italian painter, architect, and engineer, the most distinguished of Raphael's scholars, born at Rome near the end of the fifteenth century. During the lifetime of Raphael he painted with him and under his direction, and many of his productions are quite in his manner. After having finished the fresco-work in the Hall of Constantine in the Vatican at Rome, under Clement VII, he went to Mantua, where he executed a series of remarkable works in architecture, painting, and engineering. The Palazzo del T (palace of the T) was rebuilt and ornamented entirely by him, or under his direction. After the death of San Gallo in 1546 the building of St. Peter's was committed to him, but he died the same year. After the death of Raphael he gave himself up to his own imagination, and astonished all by the boldness of his style, by the grandeur of his designs, by the fire of his composition, by the loftiness of his poetical ideas, and his power of expression.

Giurgevo (jur-jā'vō), a town in Roumania, on the Danube, opposite Rustchuk, the most important shipping port on the Roumanian side of the river. The Russians were defeated here by the Turks in 1854. Pop. 13,978.

Giusti (jus'tē), GIUSEPPE, an Italian satirical and political poet, born in 1809; died in 1850. He is considered by his countrymen as the rival of Béranger in popular lyrical poetry.

Givet (zhē-vā), a town of Northeastern France, in the Ardennes, with leather manufactories and other industries. It is a place of great strategic importance, and its citadel of Charlemont is of great strength. Pop. (1906) 5110.

Givors (zhē-vōr), a town of Southeastern France, department of the Rhône, and on that river, a center of the coal trade, with ironworks, glassworks, silk weaving and dyeing-works, etc. Pop. (1906) 11,444.

Gizeh (gē'ze), a town of Egypt, on the left bank of the Nile, opposite Old Cairo. Some miles off are the celebrated pyramids, which have been named from it. Pop. 11,500.

Gizzard (giz'ard), a strong muscular part of the alimentary canal of birds, which enables them to grind their food. A gizzard occurs also in many gasteropods, and in certain cephalopods and crustaceans. In birds it is lined by a thick muscular coat, and usually contains pieces of gravel, etc., to facilitate the grinding process.

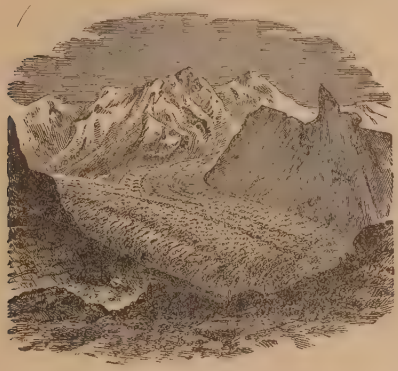
Glace Bay, a port of Cape Breton, Nova Scotia, 15 miles from Sydney. Has large coal mines. Pop. 16,561.

Glacial Period (glā'shal), or ICE AGE, in geology denotes that portion of the post-tertiary period, in which Europe and North America, north of latitude 50°—40° were subjected to intense cold, and covered with ice and glaciers to a great depth. This phenomenon has been demonstrated from a study of the actual effects of glaciers in the Alps, and of varied traces of surface change and disturbance that could have had no other origin. The traces of ancient glacial action are abundantly discoverable in Britain and Scandinavia and in other parts of Northern Europe, and are profuse across nearly the whole width of North America. They are found also in the Himalayas and some other regions. See *Geology*.

Glacier (glā'sher) NATIONAL PARK. The government of the United States has for years been acquiring localities of great natural attraction, or remarkable for unique features, to be

kept permanently unchanged as public areas. Prominent among these are the Yellowstone and the Yosemite National Parks. An important addition to this series of national areas is the Glacier National Park, set aside by acts of Congress in 1910. This lies in Northern Montana, between the Canadian border and the line of the Great Northern Railroad. It contains about a million acres, being second in area only to Yellowstone Park. The region is one of natural wonders, which range from verdant valleys and wooded heights to glacial peaks. Within the area are numerous glaciers and mountain lakes, the locality presenting many examples of sublime scenery. Birds and animals are numerous, and the locality as a whole forms a splendid addition to our series of national pleasure grounds.

Glaciers (glā'shers), icy masses of great bulk, harder than snow, yet not exactly like common ice, which cover the summits and sides of mountains above the snow-line. They are found in Switzerland, Scandinavia, the Andes, the mountains of Alaska, in



Glacier of Zermatt, Switzerland.

many parts of the Rocky Mountain range, etc. They extend down into the valleys often far below the snow-line, and bear a considerable resemblance to a frozen torrent. They take their origin in the higher valleys, where they are formed by the congelation and compression of masses of snow in that condition called by French writers *névé*, by German authors *firn*. The ice of glaciers differs from that produced by the freezing of still water, and is composed of thin layers filled with air-bubbles. It is likewise more brittle and less transparent. The glaciers are continually moving downwards, and not infrequently reach the borders of cultivation. The rate at which a glacier moves generally varies from 18 to 24 inches in twenty-four hours. At its lower end it is generally very steep and inaccessible. In its middle course it resembles a frozen stream with an undulating surface, broken up by fissures or *crevasses*. As it descends it experiences a gradual diminution from the action of the sun and rain, and from the heat of the earth. Hence a phenomenon universally attendant on glaciers—the issue of a stream of ice-cold turbid water from their lower extremity. The descent of glaciers is shown by changes in the position of masses of rock at their sides and on their surface. A remarkable glacier phenomenon is that of *moraines*, as they are called, consisting of accumulations of stones and detritus piled up on the sides of the glacier, or scattered along the surface. They are composed of fragments of rock detached by the action of frost and other causes. The fissures or crevasses by which glaciers are traversed are sometimes more than 100 feet in depth, and from being often covered with snow are exceedingly dangerous to travelers. One of the most famous glaciers of the Alps is the Mer de Glace, belonging to Mont Blanc, in the valley of Chamouni, about 5700 feet above the level of the sea. It is more especially, however, in the chain of Monte Rosa that the phenomena of glaciers are exhibited in their greatest sublimity, as also in their most interesting phases from a scientific point of view. Glaciers exist in all zones in which mountains rise above the snow-line. Those of Norway are well known, and they abound in Iceland and Spitzbergen. Hooker and other travelers have given accounts of those of the Himalaya. They are conspicuous on the Andes, while the Southern Alps of New Zealand rival in this respect the Alpine regions of Switzerland.

The problem of the descent of the glaciers is of extraordinary interest, and various theories have been put forward to account for it. It was shown by Professor J. D. Forbes, of Edinburgh, that a glacier moves very much like a river; the middle and upper parts faster than the sides and the bottom; and he showed that glacier motion was analogous to the way in which a mass of thick mortar or a quantity of pitch flows down in an inclined trough. His theory is known as the *viscous theory* of glaciers, which presupposes that ice is a plastic body, and this plasticity has been satisfactorily explained by Professor James Thomson, of Glasgow, by the phenomenon of the melting and refreezing of ice. Water, he dis-

covered, when subjected to pressure, freezes at a lower temperature than when the pressure is removed. Consequently, when ice is subjected to pressure it melts; if it is relieved of pressure the water again solidifies. Therefore if two pieces of ice are pressed together, they tend to relieve themselves by melting at their points of contact, and the water thus produced immediately solidifies on its escape. If ice is strained in any way it similarly relieves itself at the strained parts, and a similar regelation follows. This, when applied to the glaciers, gives a complete explanation of their plasticity. Pressed downwards by the vast superincumbent mass, the ice gradually yields. Melting and refreezing takes place at at strained points goes on. In the latter some parts, at others the gradual yielding process there is no visible melting, but there is the gradual yielding from point to point to the pressure above, and there is the transference relatively to each other of the molecules that constitute the, at first sight, solid mass. If, however, at certain points the strain is intense, the ice becomes extremely brittle. The latter fact disposes of Tyndall's objection to Forbes's theory, which was based on the fact that *crevasses* proved the brittleness, and not the viscosity of ice.

Glacier Tables, large stones found on glaciers supported on pedestals of ice. The stones attain this peculiar position by the melting away of the ice around them, and the depression of its general surface by the action of the sun and rain. The block, like an umbrella, protects the ice below it from both; and accordingly its elevation measures the level of the glacier at a former period. By and by the stone table becomes too heavy for the column of ice on which it rests, or its equilibrium becomes unstable, whereupon it topples over, and falling on the surface of the glacier covers a new space of ice, and begins to project afresh.

Glacis (glā'sis), in fortification, is the sloping surface of the outermost portion of a fortified line, descending from the parapet of the covered way to the level ground or open country in front. It must be so placed that the guns of the fort will rake it at every point.

Gladbach, BERGISCH- (berg'ish-glät'-bäh), a manufacturing town of Prussia, province of Rheinland, 8 miles northeast of Cologne. Pop. (1905) 13,410.

Gladbach, MÖNCHEN- (meun'hen-glät'bäh), a town of Prussia, province of Rheinland, 16 miles west of Düsseldorf, with extensive manufactures of cotton and mixed cotton goods, etc. Pop. (1905) 60,714.

Gladden, WASHINGTON, author, born at Pottsgrove, Pennsylvania, in 1836; was ordained in the Congregational Church, and became a pastor in Columbus, Ohio, in 1882. He has written very largely on social reforms and other subjects, among his books being *Tools and the Man*, *Social Salvation*, *Christianity and Socialism*, *The Church and Modern Life*, etc. Died July 2, 1918.

Gladiators (glad-i-ā'turs), combatants who fought at the public games in Rome for the entertainment of the spectators. The first instance known of gladiators being exhibited was in B.C. 264, by Marcus and Decimus Brutus at the funeral of their father. They were at first prisoners, slaves, or condemned criminals; but afterwards freemen fought in the arena, either for hire or from choice; and later men of senatorial rank, and even women, fought. The regular gladiators were instructed in schools (*ludi*), and the overseer (*lanista*) purchased the gladiators and maintained them. Men of position sometimes kept gladiatorial schools and lanistæ of their own. The gladiators fought in the schools with wooden swords. In the public exhibitions, if a vanquished gladiator was not killed in the combat, his fate was decided by the people. If they wished his death, perhaps because he had not shown sufficient skill or bravery, it is stated that they held up their thumbs; the opposite motion was the signal to save him. This, however, is doubtful, the meaning of the terms used to express it being uncertain. According to some authors, the significance of the thumb movement was the reverse of that above stated. The victor received a branch of palm or a garland. The gladiators were classified according to their arms and mode of fighting; thus there were *retiarii* who carried a trident and a net (L. *rete*) in which they tried to entangle their opponent; *Thracians*, who were armed with the round Thracian buckler and a short sword; *secutores*, who were pitted against the *retiarii*, etc.

Gladiolus (gla-dī'ō-lus), a genus of plants of the iris order, having a bulbous root with a recticulated covering, natives of Europe and N. Africa, but especially S. Africa. The leaves are ensiform, the flowers brilliantly colored. There are many species, some of them popular garden plants, others grown in hothouses.

Gladstone (glad'stun), HERBERT JOHN, son of the fa-

mous statesman, William E. Gladstone, was born at London in 1854. He was educated at Eton and Oxford and entered parliament in 1880, being private secretary to his father, then prime minister, in 1880-81, and subsequently holding various positions in the treasury, the war, and the home offices, being first commissioner of works 1894-95, and subsequently secretary of state for home affairs. In 1909 he was appointed governor-general of the newly organized commonwealth entitled the Union of South Africa.

Gladstone, William Ewart, a celebrated statesman, son of Sir John Gladstone, was born at Liverpool in 1809. He entered Eton 1821, and left it in 1827, becoming afterward a student of Christ Church, Oxford. He left college in 1831, having taken high honors. After leaving Oxford he spent six months in Italy. In 1832 the first Reform Act was passed, and Mr. Gladstone's public career commenced by his being returned for Newark, and in 1834

Right Hon. W. E. Gladstone

accepting the post of Junior Lord of the Treasury in Peel's cabinet. At this period he was a Tory, and as his party quickly went out it was not until 1841 that he again held any public office, in which year he became, under Peel, Vice President of the Board of Trade and Master of the Mint. In 1842 great fiscal reforms were inaugurated, some of which were understood to be due to Mr. Gladstone. Having become President of the Board of Trade, he carried, in 1843, a measure for the abolition of restrictions on the exportation of machinery, and in 1844 he carried a railway bill, establishing cheap trains. He took part with Peel in the repeal of the corn-laws, a course which cost him his seat for Newark. In 1847 he was returned for Oxford University, and he then supported the bill for the removal of Jewish disabilities, the repeal of the Navigation Laws, etc. He now began to develop remarkable ability as a financier, and fiercely attacked Mr. Disraeli's budget of 1852. The same year he became Chancellor of the Exchequer under the Earl of Aberdeen, a post which he also held for a short time in 1855 under Lord Palmerston. In 1858 he became High Commissioner Extraordinary to the Ionian Islands, and his *Studies on Homer* appeared about the same time. In 1859 he again took office as Chancellor of the Exchequer under Lord Palmerston. At the general election of 1865 Mr. Gladstone was returned for South Lancashire, and on the decease of Lord Palmerston he became the Liberal leader in the Commons in the Russell administration, still continuing to hold the Chancellorship of the Exchequer. The government, being defeated on the reform question, went out in 1866, and Lord Derby came into power. In 1867 a Reform Bill, establishing household suffrage in burgs, was carried by the Conservatives, but to the final shape of it Mr. Gladstone and Mr. Bright materially contributed. In 1868 Mr. Gladstone succeeded in abolishing compulsory church rates, and he also carried his resolutions dealing with the Irish Church, but his Irish Church Suspensory Bill was rejected by the Lords. At the general election of 1868 he lost his seat for South Lancashire, but was returned by Greenwich. There being a great Liberal majority in the new parliament, Mr. Disraeli was soon forced to resign, and Mr. Gladstone became premier. Next year he carried his bill for the disestablishment of the Irish Church, and in 1870 his Irish Land Act. In 1871 army purchase was abolished. The Ballot Act was passed in 1872, the *Alabama* claims were settled, and the Scottish Education Act enrolled on the statute-book. Parliament was dissolved in 1874, and the Conservatives ousted Mr. Gladstone from office, as they had secured a good majority. During Lord Beaconsfield's tenure of office Mr. Gladstone denounced the Bulgarian atrocities, the Anglo-Turkish Treaty, and the Afghan War, and his speeches during his candidature for Midlothian greatly helped to render the government unpopular. In 1880 the general election reinstated Mr. Gladstone firmly into power (Midlothian being now his constituency), and his second Irish Land Bill became law in the following year. In 1882 a

Prevention of Crimes and an Arrears Act for Ireland were passed, and in 1883 measures relating to bankruptcy, etc., were also carried. In 1884 the bill extending household suffrage to the counties was carried, and the Gladstone ministry fell the next year. Lord Salisbury, who had formed an administration, got the Redistribution of Seats Bill passed, and under it took place the general election of 1885, Mr. Gladstone still continuing to represent Midlothian. Next year Lord Salisbury resigned after an adverse vote in the Commons, and Mr. Gladstone again came into power. He soon startled the country by introducing a measure of Home Rule for Ireland. It failed to pass the Commons, and an appeal was made to the country, the result of which was emphatically adverse to Mr. Gladstone's proposals. He had to make way for Lord Salisbury. In 1892 the result was again reversed; Gladstone once more resumed authority; he resigned March 2, 1894, and died May 19, 1898, being interred with a State funeral at Westminster Abbey.

Glagolitic Alphabet (g l a g-o-lit'-ik), an ancient Slavonic alphabet. The Slavonic languages have from very ancient times been written with two alphabets, the glagolitic and cyrillic. The latter is the modern Slavonic and Russian alphabet; the former is still used in Istria, Croatia, and Dalmatia, and its use has been authorized in the Roman Catholic liturgies of those districts.

Glair (glār), the white of eggs, used as a varnish for preserving paintings. Bookbinders also use it for finishing the backs of books.

Glaisher (glā'sher), an English aeronaut and meteorologist, born in 1800, died in 1903. His balloon ascent of 37,000 ft. is the highest on record.

Glamorgan (gla-mor'gan), or GLAMORGANSHIRE, a county in South Wales; area, 576,540 acres. The north and northeast parts of the county are extremely mountainous, and often exhibit scenes of the most romantic beauty. The southern portion is comparatively level and very fertile, particularly the Vale of Glamorgan. The climate in this part is remarkably mild, as snow does not lie long on the ground, and tender shrubs thrive in the open air. Glamorganshire belongs wholly to the basin of the Severn; and all its streams, of which the Taff is the largest, flow in a south direction. The cattle are reckoned among the best in Wales. The mineral wealth of Glamorganshire is of incalculable value. Its coal-fields, its stores of ironstone and limestone, are most extensive, and the ironworks of Dowlais and Cyfarthfa are among the largest in the world. The woolen manufacture is carried on to some extent. Principal towns—Cardiff, the capital; Merthyr-Tydfil, Swansea, and Neath. The county returns five members to the House of Commons. Pop. 1,130,818.

Glance (glans), a name given to some minerals which possess a metallic or pseudometallic luster; as *antimony glance, bismuth glance, cobalt glance,* etc.

Glance-coal. See *Anthracite.*

Glanders (glan'ders), one of the most formidable diseases to which horses are subject, indicated by a discharge of purulent matter from the points of contagion, sometimes one or both nostrils, with a hard enlargement of the submaxillary glands. In acute glanders the discharge, by its copiousness, impedes respiration and ultimately produces suffocation. The disease is highly infectious, and may easily be communicated to man by the purulent matter coming in contact with the skin or mucous membrane. The disease is treated by mallein. See also the article *Farcy.*

Glands, a certain class of structures in animals, some of them forming organs which are the seat of an excretion, and provided with an excretory canal. In man there are two lachrymal glands, situated at the external angle of the eyes under the upper eyelid; six salivary, of which three are on each side, behind and under the lower jaws; two parotid, two submaxillary, two sublingual, two mammary, confined to the female (the breasts in women); the liver, the pancreas, the two kidneys, etc. The lymphatic glands, which take up and elaborate the lymph, are somewhat different from these in character; and still more different are certain other bodies denominated the ductless glands, as the spleen, thymus, pineal, thyroid, pituitary, and suprarenal (or adrenal). Botanists have given the name of glands to small bodies observed upon the surfaces of plants, and many of which seem to secrete certain fluids.

Glanvil, or GLANVILLE (glan'vil) RANULPH DE, English lawyer and warrior of the 12th century. In the reign of Henry II he held the office of justiciary, and repelled the invasion of William the Lion, King of Scotland, who was taken prisoner as he was besieging the Castle of Alnwick. Richard I is said to have imprisoned Glanvil,

and obliged him to purchase his freedom with £15,000 towards a crusade to the Holy Land. He accompanied his master on this expedition, and perished at the siege of Acre in 1190. To Glanvil is attributed a treatise on the laws and customs of England (*De Legibus et Consuetudinibus Angliæ*), written about 1181, and first printed in the year 1554, being the earliest treatise on English law.

Glarus (glä'rös), a Swiss canton, surrounded by St. Gall, the Grisons, Uri, and Schwyz, area 266 sq. miles. On all sides, except towards the north, Glarus is walled in by lofty mountains; lakes are numerous, and the scenery in their neighborhood is magnificent. The inhabitants are chiefly engaged in the cotton manufacture and in agricultural pursuits, rearing sheep and cattle, and exporting cheese, butter, etc. The constitution is a pure democracy. Pop. 33,349. The capital, Glarus, situated on the Linth amid grand scenery, is a well-built town, with a good trade. Pop. 6000.

Glasgow (glas'kō or gō), the largest city in Scotland, and the second in size in Great Britain, is situated mainly in the county of Lanark (a small portion being in Renfrew), on both banks of the Clyde, the larger and more important part of it on the right or north bank. The southern portion is built on low-lying level ground, the northern portion to a great extent on a series of elevations of varying heights. The streets are in general wide and straight, running mostly at right angles east and west, and north and south. Of the former may be mentioned as a great thoroughfare the Trongate and its continuation Argyle Street, of the latter Buchanan Street. The houses are built almost wholly of freestone, and as a whole Glasgow is now excelled by few cities in the kingdom in architectural beauty. Of the buildings the cathedral, situated in the northeast of the city, is the only one of historical interest. It is supposed to have been begun about 1240, and completed within the next two centuries. It is a large Gothic edifice in the early Pointed style, with tower and spire from the center; length of interior 319 feet; width 63 feet; height of nave 90 feet, of choir 85 feet, spire 225 feet. It is especially distinguished for the beauty of its crypt, one of the most perfect in Britain. The windows are filled with painted glass on a uniform plan. The University of Glasgow was founded in 1451, and is now a flourishing institution. Connected with it is the Hunterian Museum of anatomy, natural history, etc., left by Dr. William Hunter. The Municipal Buildings, in the center of the city, in George Square, form an imposing pile in the Renaissance style. They were completed in 1887. Most of the public monuments are collected in George Square, the finest square in the city. Glasgow has several public parks, the largest, the Green, containing 140 acres. There are also Botanic Gardens with extensive hothouses. There is a collection of pictures belonging to the city, and containing a number of very valuable works especially of the Venetian school. The industries are unequaled for variety by any town in the kingdom, with the exception, perhaps, of London. They embrace cotton, linen, woolen, silk, and jute, in all the processes of manufacture; calico-printing, dyeing, and bleaching; pig and malleable iron and steel, and machinery and metal goods of all descriptions; shipbuilding, which might almost be called a staple, over 400,000 tons of shipping having been launched in some years on the Clyde; extensive chemical works, potteries, glassworks, brickworks, breweries, distilleries, tanneries, tobacco works, sugar-refining works, etc. The commerce is commensurate in extent with the manufactures. The river itself, the chief highway of this commerce, has been navigable for large vessels up to the heart of the city, and the harbor accommodation has been and is still being extended by the construction of docks, quays (of which there are over 6 miles), and other improvements. In the extent of its merchant marine Glasgow is surpassed by few cities in the world. The improvement of the navigation of the Clyde, which within the past century was fordable at and below the present harbor of Glasgow, has been of immense service to the city, though the total cost of deepening, widening, straightening, and the construction of quays, docks, etc., has exceeded $100,000,000. Glasgow has led in the work of municipal reform in the kingdom. It has municipal markets, municipal lighting, ferries, street cars, etc. There are excellent civic departments which take care of water supply, sanitation, public health, better housing, and so forth. The public lighting is done by the city, which owns gas and electric light plants. The street-car system was taken over by the city in 1894, and improved cars were provided and the horse-cars replaced by a modern electric-traction system, completed in 1900. The city is well supplied with water, brought from Loch Katrine.

Glasgow is a very ancient city. Its origin may be traced back to the foundation of the bishopric by St. Mungo,

about 560. It was erected into a royal burgh in 1180. The first bridge was built in 1345. Its industrial importance did not begin until after the union in 1707, its previous trade being chiefly with Europe. The Union opened up the trade with the American colonies, and tobacco became a source of wealth to the Glasgow merchants. Commerce then began to take other directions, and the progress made within the nineteenth and twentieth centuries has been remarkable. It was here that Watt (q. v.) invented the steam engine. Pop. in 1610, 7644; 1713, 13,832; 1801, 77,385; 1891 (when the city limits were extended), 658,839; 1911, 784,496; 1921, 1,034,069.

Glass, an artificial substance, hard, brittle, and in its finest qualities quite transparent, formed by the fusion of silicious matters with an alkali. Of the origin of its manufacture nothing is known, but the ancient Egyptians carried the art to great perfection, and are known to have practised it as early as 2000 B. C., if not earlier. The Assyrians, the Phœnicians, the Greeks and Etruscans were all acquainted with the manufacture. The Romans attained peculiar excellence in glassmaking, and among them it was applied to a great variety of purposes. Among the most beautiful specimens of their art are the vases adorned with engraved figures in relief; they were sometimes transparent, sometimes of different colors on a dark ground, and very delicately executed. The Portland or Barberini vase is almost the only surviving specimen of its kind. The mode of preparing glass was known long before it was thought of making windows of it. The first mention of this mode of using glass is to be found in Lactantius, in the third century after Christ. St. Jerome also speaks of it being so used (422 A. D.). Benedict Biscop introduced glass windows into Britain in A. D. 647. In church windows it was used from the third century. The Venetians were long celebrated for their glass manufacture, which was established before 700 A. D. Britain did not become distinguished for glass until about the commencement of the sixteenth century. The excise laws relative to the glass manufacture were at one time complicated in the extreme, and tended to check improvements in glassmaking. These laws were repealed in 1845 by Sir Robert Peel, as part of his free-trade policy, and beneficial effects were immediately apparent in the improved quality, cheapness and greater variety of descriptions of glass produced. Glass is largely made in France, Germany, Belgium and the United States, great quantities of it being here produced.

Glass is formed by the fusion of silicious matter, such as powdered flint or fine sand, together with some alkali, alkaline earth, salt, or metallic oxide. The nature of the glass will depend upon the quality and proportion of the ingredients of which it is formed; and thus an immense variety of kinds of glass may be made, but in commerce five kinds only are usually recognized: 1. Bottle or coarse green glass. 2. Broad, spread, or sheet window-glass. 3. Crown-glass, or the best window-glass. 4. Plate-glass, or glass of pure soda. 5. Flint-glass, or glass of lead. Colored glass may be mentioned as a sixth kind. The physical properties of glass are of the highest importance. Perhaps the chief of these is its transparency, and next to that its resistance to acids (except hydrofluoric). It preserves its transparency in a considerable heat, and its expansibility is less than that of any other known solid. Its great ductility, when heated, is also a remarkable property. It can, in this state, be drawn into all sorts of shapes, and even be spun into the finest of threads. It is a bad conductor of heat, and is also very brittle. It is usually cut by the diamond.

The works in which glass is made are called *glass-houses.* They are commonly constructed of brick, and made of conical form. A large vault is made in the interior of the cone, extending from side to side, and of sufficient height to allow workmen to wheel in and out rubbish from beneath the furnace, which is placed over the vault, and separated from it by an iron grating. The materials used for the formation of the glass are sometimes calcined in a *calcar* or *fritting furnace,* and a chemical union between the ingredients commenced, forming a *frit.* But this process is not essential, and the materials, after being ground and thoroughly mixed up together, are now usually placed at once in *melting pots* or crucibles made of fire-clay, the melting-pots being then placed in the melting furnace or oven. This is a kind of reverberatory furnace, is often circular in form, arched or domed above, and capable of keeping up an immense heat. The crucibles are placed in the furnace at equal distances from each other round the circumference, each pot being opposite to an opening in the wall of the furnace in order that the crucible may be charged or discharged by the workman from without. In recent times a furnace called a *tank* furnace has come into use and enables melting pots to be dispensed with, as the material can be melted in

and worked from the furnace directly. The use of the *annealing furnace* is also essential in glassmaking, the process of allowing the glass to cool there being called *annealing*. Unless this process be very carefully managed, however, the articles formed in the glass-house will be of no use, from their liability to break by the slightest scratch or change of temperature.

Sheet glass is the commonest description of glass. It is composed of various ingredients in varying proportions, usually of sand, chalk or limestone, sulphate of soda, and cullet or broken glass. A coarse variety of it may be made of a mixture of two parts by measure of soapboilers' waste, one of soda-ash and one of cleaned sand. In France the materials employed are commonly:—sand 100 parts, sulphate of soda 30, carbonate of lime 30, coke to aid in the reduction of the sulphate of soda 5, with some dioxide of manganese to correct the greenish tinge that glass with a soda base possesses. When the materials are properly melted a quantity is taken out of the pot on the end of an iron tube about 5 ft. long, and the workman by blowing into and swinging the tube while heating and reheating the glass, imparts a cylindrical shape to the newly-formed product. The rounded extremity of the cylinder (which may be 4 ft. long or more) is softened in the furnace in order to enable the workman to blow a hole in it. This opening may be made by heating the cylinder and then stopping up the tube with the thumb, when the expansion of the air causes the cylinder to burst open at the end. The other rounded end is detached after cooling by winding round its circumference a thread of red hot glass, which causes a clear fracture. The cylinder is now split open parallel to its axis by a diamond, and then conveyed to the *flattening furnace* where it is heated and opened out into a flat sheet of glass. It is afterwards placed in the annealing furnace.

Crown glass is differently formed by different makers, but its composition is essentially the same as the best sheet glass. It used to be the only window-glass made, but its manufacture has been almost altogether superseded by that of sheet glass. The ingredients being melted and at the proper temperature, a quantity of the glass is withdrawn by the tube (to the amount, by successive addition, usually of 10 lbs. in all). By various manipulations this, from having the form of a hollow oblate spheroid, is made to assume the form of a thin circular plate, with a thick part called the *bull's eye* in the center, being the point at which an iron rod is attached to it for the purpose of causing it to revolve rapidly and spread out into a sheet before the furnace. The bull's eye used to be commonly seen in the windows of humble dwellings, the pieces of glass containing them being cheap.

Flint glass or Crystal is one of the kinds largely made, being employed for table utensils, globes, ornaments, etc. Powdered flint was formerly employed in its manufacture, but fine white sand has been substituted. The other materials are red lead or litharge, and pearl-ash (carbonate of potash). The following is said to be a good mixture:—Fine white sand, 300 parts; red lead or litharge, 200; refined pearl-ash, 86; niter, 20; with a small quantity of arsenic and manganese. The furnace is kept at a very high temperature until the whole of the materials are fused. When the glass becomes translucent the temperature is diminished until it becomes a tenacious mass. Suppose a glass vessel is to be made, the iron tube is put into the crucible, and the required quantity of glass lifted out, which after certain adjustments is rolled into a cylindrical form on an iron table called the *merver* or *marver*. The workman then blows the glass into the form of a hollow globe, and re-heats and blows until the globe becomes of the required thinness. An iron rod called the *punty* is now attached to the end of the glass furthest from the tube, and the tube detached. The workman now heats the glass on the punty, and sitting down upon a chair with smooth arms, he lays the punty upon them, and rolling it with his left hand he gives the glass a rotatory motion, while with an instrument in his right, somewhat like a pair of sugar-tongs, he enlarges or contracts the different parts of the vessel until it assumes the requisite shape. A pair of shears is also made use of in certain cases. The article is then detached from the punty, and carried to the annealing furnace. Many of the articles, after coming from the annealing furnace, are sent to the cutter or grinder. The operation of grinding is performed by wheels of various diameter and of various edges, some of iron, others of stone, and some of wood. Rich and delicate designs may be cut upon the articles by means of small wheels of copper and steel upon which emery is kept constantly falling. Ornamental figures may also be engraved, or rather etched, upon articles of glass by means of hydrofluoric acid, care being taken to place a coating of some substance over the parts not to be

acted upon. Various ornamental forms are given to the surface of glass vessels by metallic molds. The mold is usually copper, with the figure cut on its inside, and opens with hinges to permit the glass to be taken out. The angles of molded objects are always less sharp than those of cut-glass.

Green or bottle-glass is formed of the coarsest materials, such as coarse sea or river sand, lime, and clay, and the most inferior alkalies, as soapboilers' waste, and the slag of iron ore. A cheap mixture for this kind of glass may be made of common sand and lime, with a little clay and sea salt. The use of machinery has practically displaced the older form of glass blowing. The first attempt to devise a machine was made by an Australian in 1876. Soon afterward Ashley, an Englishman, designed an automatic bottle machine, which was only partially successful. Michael Owens, an American, invented a machine which has transformed the glass industry. Modern glass bottles, from the smallest vial to the five-gallon container, are now automatically made by machinery, principally of the Owens type. Either narrow-mouthed or wide-mouthed bottles may be made by this device.

Plate-glass is a fine and thick glass cast in sheets. One maker's ingredients are as follows:—white sand, 300 lbs.; soda, 200; lime, 30; oxide of manganese, 2; oxide of cobalt, 3 oz.; and fragments of glass (cullet) equal to the weight of sand. After being melted in large crucibles, and the liquid glass having been thoroughly skimmed, it is transferred by a copper ladle to smaller pots (*cuvettes*). When the glass in the smaller crucible is ready for casting it is poured upon an iron *casting-table*, and a large metal cylinder moved along spreads the glass into a broad uniform sheet. The subsequent stages of the process are concerned with the discovery of flaws, the squaring of the edges, the grinding of the surfaces plane, the grinding of the sides, and the polishing. Before grinding and polishing the glass is what is called common 'rough plate,' and in this state it is much used for roofing, cellar-lighting, etc., being non-transparent. 'Rolled plate,' which is cast on a table that imparts a surface of grooves, flutings, lines, etc., is extensively used for the same purposes.

There are several other kinds of glass that may be noticed. *Pressed glass* is *flint glass* formed into articles by pressing into moulds of iron or bronze, a fine surface being afterwards attained by heating so that a thin film on the surface melts. *Slag glass* is glass from the slag of blast-furnaces mixed with other ingredients; it is largely used for bottles. *Optical glass* is made of special varieties of flint and crown glass. *Strass*, which is used for imitating gems, is a very dense flint glass, colors being imparted by metallic oxides. *Spun glass* is glass in the form of very fine threads, in which state it may be woven into textile fabrics of great beauty. *Triplex glass* is made by covering a face of each of two sheets of glass with very thin gelatin and placing between them a very thin sheet of celluloid. These are then subjected to hydraulic pressure. Triplex glass will crack but not fly in splinters or separate.

Colored Glass.—Colored glass is of two kinds—entirely colored, the coloring matter being melted along with the other ingredients; or partially colored, a quantity of white glass being gathered from one pot, and dipped into the other containing the colored glass, by which the whole receives a skin of colored glass. The coloring matters are chiefly the metallic oxides. A beautiful yellow color is imparted by silver in union with alumina (powdered clay and chloride of silver being used), also by uranium and by glass of antimony; red colors by oxide of iron, copper, and gold; green by protoxide of iron, oxide of copper, oxide of chromium, etc.: blue by cobalt; orange by peroxide of iron with chloride of silver,

Glass, CARTER (1858-), an American cabinet officer, born at Lynchburg, Virginia. He entered the newspaper business, becoming owner of the Lynchburg *News*. For twenty years he was a member of the city council of Lynchburg, and was a member of the Virginia senate, 1899-1903. Elected congressman to fill the unexpired term of 1902-03, he continued in congress till 1918, when he became secretary of the treasury; senator in 1920.

Glass-painting, the art of producing pictures upon glass with colors that are burned in, or by the use of pieces of colored glass, in which the color forms part of the composition of the glass itself. Originally there was but one method of making ornamental glass windows, which was by the latter process; the pieces of stained or colored glass were cut to the desired shape, and let into the grooves of finely-made leaden frames which formed the pattern in outline, so that the pictures resembled mosaic work. In the sixteenth century, the *enamel* colors having been discovered, a new process came into vogue, the designs being now painted on

the glass and burned in. At the present day the two methods, or a combination of the two, are chiefly employed, the *mosaic-enamel* method being the most common, and consisting of a combination of these two. The chief seats of the art in Britain are Birmingham and Edinburgh; in France, Paris and Sèvres; in Germany, Munich and Nürnberg; in America, Philadelphia and Pittsburgh.

Glass Paper, or CLOTH, is made by strewing finely pounded glass on a sheet of paper or cloth which has been besmeared with a coat of thin glue, the glue being still wet. It is much used for polishing metal and woodwork.

Glassport, a borough in Allegheny County, Pennsylvania. It has foundries and manufactures of steel, gears, edge-tools, spikes, rivets, flint glass, etc. Pop. (1920) 6959.

Glass Snake, a lizard, genus *Ophiosaurus*, in form resembling a serpent, and reaching a length of 3 feet. The joints of the tail are not connected by caudal muscles, hence it is extremely brittle, and one or more of the joints break off when the animal is even slightly irritated.

Glass-sponges. See *Sponge.*

Glasswort (glas'wurt), a name given to the plants of the genus *Salicornia*, nat. order Chenopodiaceæ, succulent marine herbs growing abundantly on the coasts in the south of Europe and north of Africa, and when burned, yielding ashes containing soda, formerly much employed in making both soap and glass.

Glastonbury (glas'en-bér-i), a town of England, county of Somerset, which derives interest from the ruins of its once magnificent Benedictine abbey, now consisting of some fragments of the church, the chapel of St. Joseph of Arimathea, and what is called the abbot's kitchen. Its abbots sat among the barons in Parliament. The last was hanged on a neighboring eminence by order of Henry VIII for refusing to surrender the abbey. Pop. 4251.

Glatz (gläts), a town of Prussia, province of Silesia, on the Neisse, 51 miles S. S. W. of Breslau; manufactures of linen, cotton, and woolen goods, leather, carpets, etc. It has a fortress or citadel, now of little importance. Pop. (1905) 16,051.

Glauber (glow'ber), JOHN RUDOLPH, a German chemist, born in 1603 or 1604. His life seems to have been somewhat unsettled—at least he resided in many different places—Vienna, Saltzburg, Frankfort, Kitzingen, Cologne, and Basel, and finally in Amsterdam, where he died in 1668. He is chiefly remembered for his discovery of sulphate of soda or *Glauber's Salt*, which he termed *sal mirabile*, in consequence of his great faith in its medicinal qualities.

Glauber's Salt, sulphate of sodium, so called because of the importance attached to its chemical and medicinal properties by Glauber. It forms large, colorless, monoclinic prisms, which effloresce on exposure to the air. It is soluble in water, and when heated melts in its water of crystallization. It is found in many localities, both dissolved in the water of mineral springs and of salt lakes, round which it effloresces.

Glauchau (glou'hou), a manufacturing town of Saxony, on the Mulde, 54 miles W. S. W. of Dresden. It has manufactures of woolens, carpets, linens, leather, dyeworks, print-fields, and worsted mills. Pop. (1905) 24,556.

Glaucoma (glą-kō'ma), in medicine, an almost incurable disease of the eye, in which the eyeball becomes of stony hardness by the accumulation of fluid within, and the consequent increase of pressure causes disorganization of all the tissues. Loss of sight is sometimes very rapid. Called also *Glaucosis.*

Glazing (glāz'ing) is the covering of earthenware vessels with a vitreous coating in order to prevent their being penetrated by fluids. The materials of common glass would afford the most perfect glazing were it not liable to crack See *Pottery.*

Glazounof (glā'zō-nof), ALEXANDER CONSTANTINOVITCH, a Russian composer, born at St. Petersburg, August 10, 1865. He belongs to the advanced Russian school and in 1906 was appointed director of the St. Petersburg Conservatory. He has composed a number of symphonic poems, and other instrumental music; also cantatas and songs.

Gleaning (glēn'ing), the gathering by poor people of the loose ears of corn left uncared for by reapers. This is a common practice in England.

Glebe (glēb), in the established churches of England and Scotland, the land possessed as part of the revenue of an ecclesiastical benefice, usually along with a dwelling-house. The incumbent may be regarded as the proprietor of the glebe for the time being but he cannot alienate it. In Scotland, where lands are arable, the glebe must

consist of 4 acres at least. The glebe must be taken as near the manse as possible.

Gleditschia (gle-dish'i-a), a genus of plants, order Leguminosæ, to which *G. triacanthos*, the honey-locust, belongs.

Glee (glē), in music a composition in three or more parts, generally consisting of more than one movement, the subject of which may vary greatly, from grave to gay, etc. Instrumental accompaniment is illegitimate.

Gleemen (glē'men), itinerant singers in the Anglo-Saxon period of English history. After the Norman conquest they were termed *minstrels*.

Gleiwitz (glī'vits), a town of Prussia, province of Silesia, on the Klodnitz. It has extensive government ironworks, foundries, machine-works, glassworks, worsted and other mills, etc. Pop. (1910) 66,910.

Glencoe (glen'kō), a romantic Scottish valley in the county of Argyle, near the head of Loch Etive. It is bounded both sides by almost perpendicular mountains over 3000 feet high, and is traversed by a mountain stream, Ossian's 'dark torrent of Cona.' The valley was the scene of a tragedy known as the 'Massacre of Glencoe.' The state of the Highlands after 1690 was a subject of great anxiety to the government. Although the Highlanders had ceased any important operations since the death of Dundee at Killiecrankie, they had not laid down their arms. In 1691 a proclamation was issued promising pardon to all who should swear allegiance on or before 31st December. All the chiefs, with the exception of one Ian of Glencoe, complied. The latter had unfortunately exceeded the prescribed period, and a certificate which he produced to prove that he had offered to take the oaths at Fort-William was suppressed, as is thought, by Stair. The king's signature was obtained to an order to extirpate the MacDonalds. On the 1st of February, 1692, a party of soldiers, 120 in number, commanded by Captain Campbell of Glenlyon, marched up the glen and took quarters as friends. The soldiers belonged mostly to the clan Campbell, enemies of the MacDonalds; but they were well treated, and all went on merrily for twelve days. At five in the morning of the 13th Glenlyon and his men suddenly fell on the MacDonalds. Thirty-eight men were murdered, and many who had escaped perished in the snow, sank into bogs, or died for lack of food. Much obloquy has been heaped upon King William on account of his share in the massacre, but the utmost of what he would seem to have been guilty was carelessness in signing without investigation the order mentioned above.

Glen Cove, a third class city of Nassau Co., New York, on Long Island, 22 miles N. E. of Brooklyn. It is a residential place. Pop. 8664.

Glendale, a city of Los Angeles Co., California, 7 miles N. of Los Angeles, in a fruit region. It has brick and tile works, box factories, etc. Pop. (1910) 2746; (1920) 13,536.

Glendower (glen'dou-ẽr), Owen, a distinguished figure in Welsh history, born about 1350. At an early age he was sent to London, and studied for the bar, but relinquished the profession on being appointed an esquire to Richard II, whom he supported to the last. He stirred up an insurrection in Wales and caused himself to be proclaimed Prince of Wales, September 20, 1400. He defeated the king's troops, retired to the mountains, and foiled all subsequent attempts to bring him to action. He afterwards joined the coalition of the Percies against Henry, and was crowned 'sovereign of Wales.' Glendower arrived with his force too late for the battle of Shrewsbury; and, seeing all was lost, retreated, and continued his marauding warfare. This he kept up with various success, occasionally assisted by Charles VI of France. Finding it impossible to subdue him, Henry V, in 1415, condescended to treat with him; but Owen died during the negotiation.

Glenlivet (glen-liv'et), a valley or district of Scotland in the county of Banff. Whiskey of a particularly fine flavor has long been made in the district. In Glenlivet the Protestant army, under the Earl of Argyle, was defeated by a Roman Catholic force under the Earl of Huntly, in 1594.

Glenroy (glen-roi'), a deep valley in the Highlands of Scotland, parallel to Glenmore (the Great Glen), in Lochaber, Inverness-shire. It is nearly 14 miles in length, and little more than ½ mile in breadth, and is celebrated for its so-called *Parallel Roads*, which are three parallel terraces running along either side of the glen. Not only do the lines on the same side run parallel to each other, but on both sides they respectively occupy the same horizontal level. These terraces project at some parts only a few feet from the hillside, and at others widen out so as to be a number of yards in breadth. The lowest terrace is 850 to 862 feet above the sea-level; the middle, 1062 to 1077

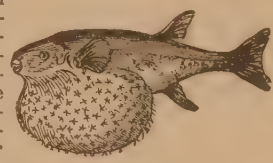
feet; and the highest 1144 to 1155 feet. Their origin has been much disputed, but according to Macculloch, Agassiz, Buckland, and Geikie, the roads are shore-lines of fresh-water lakes. As, however, no land-barrier is discoverable in the vicinity, they refer the lake or lakes to the glacial period, holding that glaciers must have descended from Ben Nevis, damming the water in Glencoe.

Glens Falls, a city of Warren Co., New York, on the Hudson River, crossed here by a viaduct; also on the Glens Falls Feeder Canal connecting at Fort Edward with the State Barge Canal. It is 58 miles N. of Albany and 9½ miles from Lake George on the border of the magnificent Adirondack country. The falls here provide water power, and there are many manufactures, including pulp, paper, cement, builders' supplies, lumber, shirt waists, shirts, etc. The neighborhood abounds in places of historical interest. In the Hudson is the cave made famous by Cooper in *The Last of the Mohicans.* Within easy access are Forts William Henry, Schuyler, Ticonderoga and Crown Point. Pop. (1910) 15,243; (1920) 16,638.

Globe (glōb), a sphere, a round solid body, which may be conceived to be generated by the revolution of a semicircle about its diameter. An artificial globe, in geography and astronomy, is a globe of metal, plaster, paper, pasteboard, etc., on the surface of which is drawn a map, or representation of either the earth or the heavens, with the several circles which are conceived upon them, the former being called the *terrestrial globe,* and the latter the *celestial globe.* In the terrestrial globe the wire on which it turns represents the earth's axis, the extremities of it representing the poles. The *brazen meridian* is a vertical circle in which the artificial globe turns, divided into 360 degrees, each degree being divided into minutes and seconds. The brass meridian receives the ends of the axis on which the globe revolves. At right angles to this, and consequently horizontal, is a broad ring of wood or brass representing the horizon; that is, the true horizon of the earth which lies in a plane containing the earth's center. The horizon and brass meridian are connected with the stand on which the whole is supported. On the surface of the globe, as on other maps, are marked parallels of latitude, meridians, etc. On a globe of some size the meridians are drawn through every 15° of the equator, each answering to an hour's difference of time between two places. Hence they are called *hour circles.* A number of *problems* or questions, many of them more curious than useful, may be solved by means of a terrestrial globe. Among the most important are such as to find the latitude and longitude of a place, the difference of time between two places, the time of the sun's rising and setting for a given day at a given place, etc.

Globe, a city, county seat of Gila Co., Arizona, 82 miles N. of Tucson. It has copper, gold and silver mines. Pop. (1920) 7044.

Globe-fish, the name given to several fishes of the genera *Diŏdon* and *Tetraŏdon,* order Plectognathi, remarkable for possessing the power of suddenly assuming a globular form by swallowing air or water, which, passing into a ventral sac, inflates the whole animal like a balloon.



Pennant's Globe-fish (*Tetraŏdon lævigātus*).

Globe-flower, a popular name of *Trollius Europæus* (nat. order *Ranunculaceæ*), a common European plant in mountainous regions, having deeply five-lobed serrated leaves and round pale-yellow blossoms, the sepals of which are large and conspicuous, while the petals are very small. It is often cultivated in gardens, and is common in mountain pastures in Great Britain. It is represented in America by only one species.

Globigerina (glō-bi-jer-ī'na), one of the Foraminifera, a microscopical animal having a many-celled shell, found fossil in the chalk and tertiary formations, and still so abundant in our seas that its shells after death form vast calcareous deposits of mud or ooze known as 'globigerina ooze.'

Globulin (glob'ū-lin), a substance forming a considerable proportion of the blood globules, and also occurring, mixed with albumen, in the cells of the crystalline lens of the eye. It resembles albumen.

Glockner (glok'nêr), or GROSS GLOCKNER, a mountain in Austria belonging to the Noric Alps, on the frontiers of the Tyrol, Carinthia, and Salzburg. It is 12,350 feet in height, and takes its name from the resemblance of the principal summit to a large bell.

Glogau (glō'gou), or GROSS-GLOGAU, a Prussian town and fortress in Silesia, on the Oder, 54 miles N. W. of Breslau. It has a Lutheran and a

Catholic gymnasium, some manufactories and a brisk inland trade. Its principal edifices are four churches, one of them formerly having been a cathedral. Pop. (1905) 23,461.

Glommen (glōm'en), the largest river in Norway, issues from Lake Oresund, about 2417 feet above the sea-level, in the southeast of South Trondhjem, flows generally S., and after a course of above 370 miles falls into the Skagerrack at Frederikstadt.

Gloria (glor'i-a). See *Doxology.*

Gloriosa (glo-ri-ō'sa), a genus of tuberous-rooted, climbing herbs of the nat. order Liliaceæ, so named from the splendid appearance of its flowers. They have branched stems and flowers mostly of a beautiful red and yellow color, with six long, lanceolate, undulated segments, which are entirely reflexed. *G. superba*, a native of India and tropical Africa, is cultivated in hothouses.

Glory Pea, a name given to *Clianthus Dampieri*, a leguminous plant, native of the desert regions of Australia, a low, straggling shrub with light-colored, hairy, pinnate leaves, and large, brilliant scarlet flowers, the standard or banner petal of which appears in the form of an elongated shield with a dark brown boss in the center.

Gloss (glos), an explanation of some verbal difficulty in a literary work, written at the passage to which it refers. The earliest glosses, as those in Greek, Latin, and Hebrew MSS., were interlinear; they were afterwards placed in the margin, and extended finally in some instances to a sort of running commentary on an entire book.

Glossary (glos'a-ri), a limited or partial dictionary, a vocabulary of words used by any author, especially in an old author, or one writing in a provincial dialect, or of words occurring in a special class of works, of the technical terms of any art or science, of a dialect, and the like.

Glossop (glos'sup), a municipal borough of England, in Derbyshire, 30 miles from Sheffield. It is the principal seat of the Derbyshire cotton manufacture, and there are also woolen and paper mills, iron foundries, dyeing, bleaching and print works, etc. Pop. 21,526.

Glottis (glot'is), the opening at the upper part of the trachea or windpipe, and between the vocal chords, which, by its dilatation and contraction, contributes to the modulation of the voice. See *Larynx.*

Gloucester (glos'tẽr), a city and river port of England, capital of the county of same name, on the left bank of the Severn, here divided into two channels inclosing the Isle of Alney and crossed by two fine bridges, 33 miles north by east of Bristol, and 95 miles west by north of London. It carries on a considerable shipping trade, the Gloucester and Berkeley canal giving access to the docks. The most remarkable public edifice is the cathedral; it was originally the church of a Benedictine abbey, dating from 1058, and was converted into a cathedral at the Reformation. It exhibits a great variety of styles, the choir, with its roof of fan-tracery being a fine example of Perpendicular Gothic. Other buildings are several handsome old churches, the shire hall, the guildhall, the bishop's palace, county schools of art and science, etc. The schools include the collegiate school founded by Henry VIII, the theological college, the blue-coat school founded in 1666 (and now known as Sir Thomas Rich's school), and the grammar-school of St. Mary de Crypt, founded in the time of Henry VIII. The industries are rather varied, including iron and shipbuilding works, manufactures of cutlery, chemicals, soap, matches, and various others. Pop. 50,029. The county of Gloucester or Gloucestershire borders on the west on the estuary of the Severn, and has an area of 1237 sq. miles. The county is naturally divided into three distinct districts, the Hill or Cotswold in the E.; the Severn Valley in the middle; and the Forest of Dean in the W. The principal rivers are the Severn, with its affluents the Wye, the Leden, and Lower and Upper Avon; and the Isis or Thames, with its affluents the Colne, Churnet, and Windrush. Iron and coal are plentiful and lead ore is found. Limestone and freestone are also met with. Agriculture is in a flourishing state, especially in the vale districts of the county. Gloucester is, however, much more of a dairy than an agricultural county. The celebrated cheese, known as double and single Gloucester, is produced chiefly in the Vale of Berkeley. Orchards are numerous, from the produce of which large quantities of cider are made. Gloucester is a considerable manufacturing county, and has been long famous for its fine broadcloths. Pop. (1911) 672,581.

Gloucester, a city and port of Essex County, Massachusetts, near the extremity of Cape Ann, 28 miles N. N. E. of Boston. It is a popular summer resort, and fisheries and granite quarrying are the chief industries. The

fishery interests are the largest of any place in the United States, and there is a large foreign import trade. It was founded in 1623, chiefly by settlers from Gloucester, England. Here is the oldest Universalist Church in the United States, founded in 1770. About two miles distant is Norman's Woe, the scene of the wreck of the 'Hesperus,' celebrated by Longfellow. Pop. (1920) 22,947.

Gloucester, a city of Camden Co., New Jersey, on Delaware River, 5 miles S. of Philadelphia, with ferry connection. It has shipbuilding plants, chemical works, incandescent gas mantle factories, rug and blanket factories, etc. There is a U. S. immigration station here. Pop. (1920) 12,162.

Gloucester, ROBERT OF, a monk of the abbey of Gloucester, flourished in the latter half of the thirteenth century; wrote a chronicle of England extending from the siege of Troy to the year 1270.

Glover, RICHARD, an English poet, born 1712; died 1785. Though engaged in mercantile pursuits, he devoted much of his attention to literature, and secured a high reputation as a scholar and poet. In 1760 he entered parliament, where his abilities gained him considerable influence. He was the author of two epics, *Leonidas* and the *Atheniad;* and two tragedies, *Boadicea* and *Medea.*

Gloversville (gluv'ers-vil), a city of Fulton Co., New York, 44 miles N. W. of Albany. It is largely engaged in the manufacture of gloves (whence its name); also of glove and shoe leather and hardware products. Pop. (1910) 20,642; (1920) 22,075.

Gloves (gluvs) are coverings for the hand, or for the hand and wrist, with a separate sheath for each finger. They are made of leather, fur, cloth, silk, linen thread, cotton, worsted, etc. The chief leathers used in glove manufacture are doe, buck, and calf-skins; sheepskin for military gloves; lambskin for much of the so-called kid gloves; true kid for the best and finest gloves; dog, rat, and kangaroo skins, etc. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes. Leather gloves are usually cut out by means of dies, and sewed by a machine of peculiar construction. The best woolen, thread, and silk gloves are made by cutting and sewing, but commoner gloves are made by knitting and weaving. Gloversville, in New York, is the chief American seat of the manufacture. In England leather gloves are manufactured at London, Worcester, and elsewhere. Limerick was formerly celebrated for gloves of a peculiarly delicate kind. Italy, Belgium, Sweden, Denmark, and Germany all manufacture excellent gloves, but France supplies the world with most of the finer and more expensive kinds. Gloves are a very ancient article of dress, and many curious customs and usages are connected with them. Throwing the glove down before a person amounted to a challenge to single combat. The judges in England used to be prohibited wearing gloves on the bench; and it was only in case of a maiden assize that the sheriffs were allowed to present a judge with a pair of gloves.

Glowworm (glō'wurm), an insect of the genus *Lampyris* (*L. noctilūca*), of the order Coleoptera, or beetles, the name being strictly applicable only to the female, which is without wings, somewhat resembles a caterpillar, and emits a shining green light from the extremity of the abdomen. The

GLOWWORM (*Lampyris noctiluca*).

1, Male. 2, Female, upper side. 3, Female, under side, showing the three posterior segments (*a*) from which the light proceeds.

male is winged, and flies about in the evening, when it is attracted by the light of the female, but gives out no light itself. It would seem that the glowworm possesses the power of moderating or increasing the light at will. Decapitated specimens retain their power of giving out light for a considerable time. In pure oxygen, warm water, or when crushed, the light of the luminous organs is increased in intensity. The larvæ are very voracious, living on snails, which they attack and kill.

Gloxinias.

Gloxinia (gloks-in'i-a), a genus of plants, nat. order Gesneraceæ, distinguished by the corolla approaching to bell-shaped, the upper lip shortest and two-lobed, the lower three-lobed, with the middle lobe largest, and

also by the summit of the style being rounded and hollowed. The species are natives of tropical America. They are valued as among the greatest ornaments of our gardens, owing to their richly colored leaves and their ample, graceful, delicately tinted flowers.

Gluchov, or GLOUKHOV (glö'hov), a town of Russia, government of, and 148 miles east by north from, Tchernigov. Pop. 14,856.

Glucic Acid (glū'sik; or GLUCINIC, $C_{12}H_{18}O_9$). an acid produced by the action of alkalies or acids on sugar. It is a colorless, amorphous substance, is very soluble in water, attracts rapidly the moisture of the air, and its solution has a decidedly sour taste. All its neutrally reacting salts are soluble.

Glucina (glū-sī'na), the only oxide of the metal glucinum or beryllium. It is white, tasteless, without odor, and quite insoluble in water, but soluble in the liquid fixed alkalies.

Gluci'num. Same as *Beryllium.*

Gluck (gluk), ALMA, American soprano, born at Bucharest, Roumania, in 1886, was brought to America when she was three years old. She began her vocal studies with Buzzi-Peccia in New York in 1906, and made her operatic début in the Metropolitan Opera House in November, 1909. She gained first rank in grand opera and later became a prime favorite on the concert stage. In 1914 she married Efrem Zimbalist, the celebrated violinist.

Gluck (gluk), CHRISTOPH WILIBALD, a German musical composer, born in Bavaria in 1714; died in Vienna, 1787. When a boy he became a chorister, and acquired some skill on the harpsichord and organ. He came under the patronage of Prince Lobkowitz and Prince Melzi, who placed him under the tutelage of the famous organist and composer, Sammartini, in Milan. His first opera was *Artaserse,* produced at Milan in 1741, and he wrote eight other operas within five years. Invited to London he produced *La Caduta de' Giganti* (*The Fall of the Giants*), which was not a success and was withdrawn after a few performances, despite the fact that it set forth the victories of the Duke of Cumberland. Another opera, *Artamene,* written earlier, met with favor.

In London Gluck became deeply impressed with the majestic character of Handel's airs and choruses, and with the simple but natural dramatic style of Dr. Arne. This visit to London, and a short trip to Paris, helped to develop that lyric genius which was destined to create a new order of musical composition. After producing many pieces of the usual class of opera at Paris, Vienna, Rome, and Naples, he returned to Vienna. The *Trionfo di Clelia* (1762) was the last of his operas in his first style. However well pleased the public was with his music, he was not so. He felt himself continually cramped by the character of the libretti of Metastasio, who had hitherto furnished him with texts, which were rather lyrical dramatic poems than genuine dramas. The composer at last found a poet in the person of Raniero Calzabigi, who sympathized with him in his ideas, and the result of their co-operation was the *Orfeo ed Euridice,* performed publicly for the first time in 1762. This opera marked a new era. The fame it acquired at once it never lost. Various works of lighter character filled up the interval between this year and 1766, when his second great opera of *Alceste* was produced, which raised public feeling to the point of enthusiasm. In his dedication of this work to the Grand-duke Leopold of Tuscany he enunciates the principles of the new school, which shortly were that the opera should be a musical drama, not a concert in costume; that the text must be descriptive of real passion; that the music must voice fully the spirit of the text; that in accompaniments the instruments must be used to strengthen the expression of the vocal parts by their peculiar characters, or to heighten the general dramatic effect by employing them in contrast to the voice. Gluck now became convinced that his system must be tested on a wider field, and believed that the Royal Opera in Paris offered all a composer could demand. A Frenchman of culture and genius, Bailly du Rollet, adapted Racine's *Iphigénie en Aulide* for musical treatment, and after a considerable amount of opposition from the musical critics of the old Italian and French school, at that time represented in Paris by Piccini, the piece was brought out in 1774. The intensest excitement prevailed; all Paris took sides, and for a long time the Gluckists and Piccinists contended with much bitterness, but ultimately the victory remained with the Gluckists. Shortly after the production of the *Iphigénie,* the *Orfeo* was adapted for and put on the French stage, and was followed by the *Armide* in 1777, and by the *Iphigénie en Tauride* in 1779, Gluck's last important work, and by many considered his greatest. It ends the series of works which gave a direction to the operatic genius of Méhul and Cherubini

in France, and of Mozart and Beethoven in Germany.

Glückstadt (glŭk'stât), a town of Prussia, in Holstein, on the Elbe, 28 miles N. W. of Hamburg. Formerly important as a fortress, it is now a sort of sub-port to Hamburg. Fishing is carried on to a considerable extent. Pop. 6586.

Glucose (glō'kōs; $C_6H_{12}O_6$), a variety of sugar, less sweet than cane-sugar, existing in grapes, and produced from cane-sugar, starch, dextrin, cellulose, etc., by the action of acids, certain ferments, and other reagents. There are two varieties of it, distinguished by their action on polarized light, viz., *dextroglucose* which turns the plane of polarization to the right; and *lævoglucose*, which turns it to the left. When heated up to 400° it becomes caramel, and is used by cooks and confectioners as a coloring matter. It is called also *Grape-sugar* and *Starch-sugar*, and is produced both in the solid and in the liquid form, its manufacture being now of considerable importance. In the United States the liquid sugar, as prepared from Indian corn starch, is what is generally known as glucose, and it is used for various purposes, as for confectionery, canning fruits, making artificial honey for table syrup, in brewing, etc.

Glucosides (glō'kō-sīdz), a large class of substances occurring in animal or vegetable products, possessing the common property of yielding glucose and other products when they are boiled with dilute acids, or are acted on by certain ferments.

Glue (glō), a gelatinous substance obtained from different tissues of animals, and used as a cement for uniting pieces of wood or other material. The best quality is obtained from fresh bones, freed from fat by previous boiling, the clippings and parings of ox-hides, the older skins being preferred; but large quantities are also got from the skins of sheep, calves, cows, hares, dogs, cats, etc., from the refuse of tanneries and tanning works, from old gloves, from sinews, tendons, and other offal of animal origin. By a process of cleaning and boiling the albuminoid elements of the animal matter are changed into gelatine. This in a soft, jelly-like state constitutes *size;* dried into hard, brittle, glassy cakes, which before use must be melted in hot water, it forms the well-known glue of the joiner, etc. When a solution is mixed with acetic or nitric acid it remains liquid, but still retains its power of cementing; in this state it is called *liquid glue*. *Marine Glue* is a cement made by dissolving India rubber in oil of turpentine or coal-naphtha, to which an equal quantity of shellac is added.

Glume (glōm), in botany the imbricate scale-like bract inserted on the axis of the spikelet in Gramineæ (grasses) and Cyperaceæ (sedges). The glume forms the husk or chaff of grain, called also the *palea* or *pale*.

Gluten (glō'tun), a tough, elastic substance of a grayish color, which becomes brown and brittle by drying, found in the flour of wheat and other grain. It contributes much to the nutritive quality of flour, and gives tenacity to its paste. A similar substance is found in the juices of certain plants.

Glutton (glut'on), the *Gulo Arcticus*, a carnivorous quadruped, about the size of a large badger, and intermediate between the bear family (Ursidæ) and the weasels (Mustelidæ), resembling the former family in general structure and the latter in dentition. It inhabits Northern Europe and America, and is known also by the name of *Wolverene* or *Wolverine*. The glutton is slow and deficient in agility, but persevering, cunning, fierce, and of great strength. It prefers putrid flesh, and has an extremely fetid odor. The fur is valuable, that from Siberia being preferred from its being of a glossy black. The animal receives its name from its voracity, which, however, has been greatly exaggerated.

Glycerine (glis'ér-in; $C_3H_8O_3$), a transparent colorless liquid, chemically described as a triatomic or trihydric alcohol, obtained from the by-products of candle and soap factories by saponification with alkalies or by the action of superheated steam. It has a sp. gr. 1.267, and sometimes solidifies at a low temperature to a crystalline mass. It absorbs moisture from the air, and dissolves in or mixes with water and alcohol in all proportions, but is insoluble in ether. It acts as a solvent both on inorganic and organic bodies. The uses of glycerine are very numerous. Its applications in pharmacy are almost endless; as an external application in chaps, rough skin, chafing, etc., it is much used. Internally it is frequently prescribed in combination with iron, and also as a substitute for cod-liver oil, and in cases of diabetes. In the arts it is used wherever a substance requires to be kept more or less moist, for example, modeling clay, tobacco, paper for printing, etc.; also in spinning, weaving, ropemaking, and tanning. It is an excellent preservative medium for meat, and for natural history specimens; and its property of lowering

the freezing-point of water makes it useful in gas-meters, floating-compasses and the like. It is also the starting-point of certain valuable chemical products, one of the chief of which is nitroglycerine.

Glycogen (glī'kō-jin), in organic chemistry and physiology, a proximate non-nitrogenous principle occurring in the epithelial cells of the liver, where it exists as an amorphous matter. In properties it seems to be intermediate between starch and dextrine, and in contact with saliva, pancreatic juice, diastase, or with the blood or parenchyma of the liver, it is converted into glucose.

Glycol (glī'kōl or kol; $C_2H_6O_2$), the type of a class of artificial compounds intermediate in their properties and chemical relations between alcohol and glycerine, or the bodies of which these are the types. Otherwise expressed, glycol is a diatomic acid, alcohol being a monatomic and glycerine a triatomic. It is liquid, inodorous, of a sweetish taste, and insoluble in water and alcohol.

Glycon (glī'kon), an Athenian sculptor known by his colossal marble statue of Heracles, commonly called the 'Farnese Hercules,' now in the museum at Naples. He probably lived in the first century B. C.

Glycyrrhiza (gli-si-rī'za), a genus of leguminous plants, of which *G. glabra*, the liquorice plant, is the type.

Glyptodon (glip'to-don; Gr. *glyptos*, engraved, and *odous*, tooth—so named from its fluted teeth), a gigantic fossil edentate animal, closely allied to the armadilloes, found in

Glyptodon (*Glyptodon clavipes*).

the upper Tertiary strata of South America. It was of the size of an ox, and was protected by a coat of mail formed of polygonal osseous plates united by sutures.

Glyptosaurus (glip-to-sạ'rus), a genus of fossil land lizards, found in 1871 in the Tertiary beds of Wyoming, and so named from the fact that the head and parts of the body were covered with highly ornamented bony plates (Gr. *glyptos*, engraved). Four species were discovered, the largest about four feet long.

Gmelin (gmel'in), JOHANN GEORG, a German naturalist, born in Tübingen in 1709; died 1755. On taking his medical degree he went to St. Petersburg, and became professor of chemistry and natural history. In 1733, at the expense of the Empress of Russia, he took part in an exploring expedition to Siberia, returning to St. Petersburg in 1743, where he published his *Flora of Siberia*. He became professor of botany and chemistry at Tübingen in 1749, and published *Travels in Siberia* (1752). —His nephew, SAMUEL GOTTLIEB, botanist and traveler, was born in 1744, at Tübingen, where he studied physic, and in 1763, took the degree of doctor of medicine. He obtained a professorship of botany at St. Petersburg about 1766, and published a *Historia Fucorum*, 1768. He traveled in Asia, and being imprisoned by the Khan of the Chaitaks, he died in confinement in 1774. His *Travels* appeared in 1770-84.—Another nephew, JOHANN FRIEDRICH, was born 1748, died 1804. He was professor of medical science at Göttingen for about thirty years; published a *Dictionary of Botany*, and a *History of Natural Sciences*, and edited an edition of Linnæus.

Gmelina (gmel-i'na), an Asiatic genus of plants belonging to the order Verbenaceæ. All the species form shrubs or trees, some of the latter affording very valuable timber.

Gmünd (gmünt), a town of Würtemberg, on the Rems, 28 miles E. N. E. of Stuttgart, formerly an imperial free city. It has three churches of great antiquity, and an extensive museum of industrial products. The manufactures are chiefly woolen and cotton goods, jewelry, and trinkets. Pop. 18,700.

Gmunden (gmụn'dėn), a town of Upper Austria, situated among magnificent scenery, on the Traun, where it issues from the northern extremity of the lake of that name, 35 miles southwest of Linz. Most of the inhabitants are employed in the neighboring salt-mines. Gmunden is a favorite health-resort and summer residence. Pop. with suburbs 7126.

Gnaphalium (na-pha'li-um), a genus of widely-spread composite plants having their foliage usually covered with a white wooly down, and their flower-heads of the 'everlasting' kind. *G. Leontopodium* is the *edelweiss* of the Alps (which see). *G. polycephalum* is the cotton-weed, common in the United States.

Gnat (nat), the name applied to several species of insects of the genus *Culex*. The common gnat (*C.*

pipiens), type of the sub-family Culicidæ, is of wide geographical distribution, and is noted for its power of inflicting irritating wounds. The proboscis or sting of the female is a tube containing four spiculæ of exquisite fineness, dentated or edged; these are modified mandibles and maxillæ. The males do not sting, and are further distinguished by their plume-like antennæ. These insects also feed on the juice of plants. The female deposits her eggs on the surface of stagnant water in a long mass. After having remained in the larval state for about twenty days, they are transformed into chrysalids, in which all the limbs of the perfect insect are distinguishable, through the diaphanous robe with which they are then shrouded. After remaining three or four days wrapped up in this manner, they become perfect insects. The troublesome mosquito belongs to the same genus.

Gneisenau (gnī'zn-ou), August Wilhelm Anton, Count Neidthard von, a Prussian general, born in 1760; died 1831. He served with the German auxiliaries of England in America; and as chief of Blücher's staff chiefly directed the strategy of the Prussian army at Waterloo. He was made field-marshal in 1831.

Gneiss (nīs), a species of rock, composed of quartz, felspar, and mica, arranged in layers. The layers, whether straight or curved, are frequently thick, but often vary considerably in the same specimen. Gneiss passes on one side into granite, from which it differs in its foliated structure, and on the other into mica slate. It is rich in metallic ores, gold, silver, cobalt, antimony, copper, iron, etc., occurring in this rock, but it contains no fossil remains. Porphyritic gneiss presents large distinct crystals of felspar which traverse several of the foliated layers. Gneiss often contains hornblende in place of mica, and then receives the name of syenitic gneiss. The only difference between this rock and granite consists in the foliation of gneiss, the materials of granite being crystallized promiscuously, those of gneiss being segregated in layers. It is the principal rock of very extensive districts; it predominates in Norway, and all the north of Europe. It abounds in the Southern Alps and the Pyrenees, and forms the loftiest chains of the Andes of Quito. In the United States, also, gneiss is a common rock, especially in New England and the eastern and southern parts of New York.

Gneist (gnīst), Heinrich Rudolf Hermann Friedrich, a German jurist, born at Berlin in 1816 and studied at the university there, in which, in 1844, he became professor-extraordinary, and in 1858 ordinary professor. He likewise took part in politics as a member of the Prussian House of Deputies, and of the diet of the German Empire, ranging himself on the liberal side. He wrote extensively on law, constitutional history, etc., and had a specially thorough knowledge of English constitutional history, his *History of the English Constitution* having been translated and published in England in 1886. He died in 1895.

Gnesen (gnā'zn), a town of Prussia, province of Posen, 45 miles southwest of Bromberg. It is an ancient place; is the see of an archbishop, and has a cathedral, in which the kings of Poland used to be crowned. Pop. 23,727.

Gnome (nōm; Greek, *gnōmē*), a short, pithy saying, often expressed in figurative language, containing a reflection, a practical observation, or a moral maxim. Among the Greeks Theognis, Phocylides, and others are called the *Gnomic poets*, from their sententious manner of writing.

Gnome (nōm), in the cabalistic and mediæval mythology, the name given to the spirits which dwell in the interior of the earth, where they watch over mines, quarries, and hidden treasures. They assume a variety of forms, but are generally grotesque dwarfs, ugliness being their appropriate quality, though the females, *gnomides*, are originally beautiful.

Gnomon (nō'mon), the style of a dial, or a structure erected perpendicularly to the horizon, from whose shadow the altitudes, declinations, etc., of the sun and stars may be determined. The gnomon is usually a pillar or column or pyramid erected upon level ground. It was much used by the ancient astronomers, and gnomons of great height, with meridian lines attached to them, are still common in France and Italy.

Gnomonics (nō-mon'iks), the art and theory of making sun-dials on true scientific principles.

Gnostics (nos'tiks; Greek, *gnosis*, knowledge), a general name applied to early schools of philosophical speculators, which combined the fantastic notions of the oriental systems of religion with the ideas of the Greek philosophers and the doctrines of Christianity. They nearly all agreed on the points that God is incomprehensible; that matter is eternal and antagonistic to God; that creation is the work of the

Demiurge, an emanation from the Supreme Deity, subordinate or opposed to God; and that the human nature of Christ was a mere deceptive appearance. Certain forms of Gnosticism are mere adaptations of the Persian dualism to the solution of the problem of good and evil; while the pantheism of India seems to have been a pervading influence in others. Simon the magician (Simon Magus), of whom Luke speaks in the *Acts of the Apostles*, is generally looked on as the first of the Gnostics. The dogmas of the earliest Gnostics may be reduced to the following heads:—God, the highest intelligence, dwells at an infinite distance from this world, in the Abyss, removed from all connection with every work of temporal creation. He is the source of all good; matter, the crude, chaotic mass of which all things were made, is, like God, eternal, and is the source of all evil. From these two principles, before time commenced, emanated beings called *æons*, which are described as divine spirits, inhabiting the Plerōma, or plenitude of light, which surrounds the Abyss. The world and the human race were created out of matter by one æon, the Demiurge, or, according to the later systems of the Gnostics, by several æons and angels. The æons made the bodies and the sensual soul of man of this matter; hence the origin of evil in man. God gave man the rational soul; hence the constant struggle of reason with sense. What are called gods by men (for instance, Jehovah, the God of the Jews) are merely such æons or creators, under whose dominion man became more and more wicked and miserable. To destroy the power of these creators, and to free man from the power of matter, God sent the most exalted of all æons, to which character Simon first made pretensions. The Nicolaitans mentioned in the *Revelation of St. John*, so called from Nicolas, a deacon of the church at Jerusalem, were one of the earliest sects, and are described as forerunners of the Cerinthians. Cerinthus, a Jew, of whom John the evangelist seems to have had some knowledge, combined such reveries with the doctrines of Christianity, and maintained that the most elevated æon sent by God for the salvation of man, was Christ, who had descended upon Jesus, a Jew, in the form of a dove, and through him revealed the doctrines of Christianity, but before the crucifixion of Jesus separated from him, and at the resurrection of the dead will again be united with him, and lay the foundation of a kingdom of the most perfect earthly felicity, to continue 1000 years. Carpocrates and the sect of the Ophites (beginning of the second century), to whom the term Gnostic was first applied, saw in the Serpent a wise and good being, and carried to its extreme form the inversion of the Biblical story. The later Gnostics have been divided into three schools. The first was the Syrian, founded by Menander, a pupil of Simon. This school emphasizes the conflict between Good and Evil—the Supreme Deity on the one hand, and the Demiurge and his angels or æons on the other. The second was the school of Alexandria, represented by Basilides and Valentinus; the system of the latter being the most complete and ingenious of all. In that light or plenitude, which all the Gnostics speak of as surrounding the residence of the Supreme God, he has placed fifteen male and as many female æons. The Supreme God, the Unbegotten, the Original Father, whom he also calls the *Deep* (Bathos), is the first of these æons; Thinking Silence was his wife, and Intelligence, a male, and Truth, a female, were their children. These produced The Word and Life, the latter a female, who gave birth to mankind and society. These eight constituted the first class of the thirty æons. The second class, of five couples, at the end of which stood the Only Begotten, and the third, of six couples, at the head of which stood the Comforter, were, in a similar manner, descended from Mankind and Society, and whom all the æons of the kingdom of the other æons in their duties; and Jesus, consisted, like the first, of personified ideas. The officers of this heavenly state are four male æons—Horus, who guards the boundaries of the region of light; Christ and the Holy Ghost, who instruct light begat in common, and endowed with their gifts. Man and the world were formed by a demiurge out of matter which was partly material, partly spiritual, partly soul-like. Christ, the Saviour of men, when he appeared on earth had a visible body made of the spiritual and the soul-like substance only. At his baptism the æon Jesus united itself with him, and instructed mankind. A third school of Gnosticism, whose center was Asia Minor, was represented by Marcion of Pontus, the son of a Christian bishop, who flourished about the middle of the second century. Marcion assigned to Christianity, as the one absolutely independent religion, a complete isolation from the Old Testament revelation, the author of which was, in his opinion, merely a just but not a good being. The true God begat many spirits, among which were the creator of the world, the righteous God, and the lawgiver of the

Jews. The last, through the prophets, promised Christ; but Jesus, who actually appeared, and is the true Redeemer, was the Son of the truly good God, and not the Jewish Messiah. Towards the end of the second century Tatian, a Syrian Christian, adopted Gnostic doctrines, and founded a sect. Bardesanes, a Syrian, and Hermogenes, an African, who, in the reign of the Emperor Commodus, apostatized from Christianity, and established sects, bordered, in their hypotheses concerning the origin of good and evil, upon Gnosticism. There have been no Gnostic sects since the fifth century; but many of the principles of their system of emanations reappear in later philosophical systems, drawn from the same sources as theirs.

Gnu (nö), the *Wildebeeste* ('wild beast') of the colonists, the name given to two species of South African antelope (*Catoblĕphas gnu*, and *C. gorgon*). The former species is now rarely found south of the Vaal; its form partakes of that of the antelope, ox, or horse. Both sexes have horns projecting slightly outwards and downwards, then forming an abrupt upward bend. They have bristly black hair about the face and muzzle, a white, stiff mane, and horse-like tail. They attain a length of about nine feet, and stand about four feet high at the shoulder. They live in herds; are said to be fierce when attacked, but when taken young have been found to be capable of domestication. The brindled gnu (*C. gorgon*) is larger than the common gnu, has black stripes on the neck and shoulders, and a black tail. Both species wheel in a circle once or twice before setting off when alarmed.

Goa (gō'a), a city in Hindustan, on the Malabar coast, capital of the Portuguese territory of the same name. The name is applied to two distinct places, namely, Old Goa, and New Goa or Panjim. The former was once the chief emporium of commerce between the East and West, and had a population of 200,000, but it is now nearly deserted, though some pains are taken to keep the ancient churches and convents in repair; pop. less than 2000. New Goa or Panjim was chosen as the residence of the Portuguese viceroy in 1759; and in 1843 it was made the capital of Portuguese India. It is situated on the left bank of the Mandavi, about 3 miles from its mouth, contains many fine public buildings, cathedral, viceregal palace, etc. The trade of Goa, at one time the most extensive of any place in India, is now inconsiderable. Pop. 8440. The territory around Goa belonging to the Portuguese has an area of 1062 sq. miles. It is well watered and fertile. About two-thirds of the total population, numbering about 475,000, are the descendants of Hindus converted to Christianity on the subjugation of the country by the Portuguese.

Goalanda (gō-ä-län'dä), a river mart and municipality of Bengal, at the confluence of the main streams of the Ganges and Brahmaputra. Pop. 8652.

Goalpara (gō-äl-pä'rä), a district of British India, prov. of Assam; area 3897 sq. miles; pop. about 450,000. It lies on both sides of the Brahmaputra, and is exposed to river floods. Rice is the staple crop; and brass and iron utensils, gold and silver ornaments, etc., of an artistic character are manufactured. Goalpara Town is the chief center of trade. Pop. 6287.

Goa Powder (gō'a), a powder used in the treatment of certain skin diseases, obtained from the pith of a leguminous tree, a species of *Centrolobium*, and called also Araroba Powder.

Goat (gōt), a well-known horned ruminant quadruped of the genus *Capra*. The horns are hollow, erect, turned backward, annular on the surface and scabrous. The male is generally bearded under the chin. Goats are nearly of the size of sheep, but stronger, less timid, and more agile. They frequent

Goat of Cashmere.

rocks and mountains, and subsist on scanty, coarse food. Their milk is sweet, nourishing, and medicinal, and their flesh furnishes food. Goats are of almost interminable variety, and it is not certainly known from which the domestic goat is descended, though opinion favors the *C. ægagrus*, or wild goat of Western Asia. Goats are generally subdivided into ibexes and goats proper. They are found in all parts of the world, and many

varieties are valued for their hair or wool. The skin is prepared for a variety of purposes, and yields the leather well known under the name of *morocco*. The Cashmere goat, as its name indicates, is a native of Cashmere; it is smaller than the common domestic goat, and has long, silky, fine hair. The Angora goat is also furnished with soft silky hair of a silver-white color, hanging down in curling locks 8 or 9 inches long. Its horns are in a spiral form, and extend laterally. The Rocky Mountain goat is the *Haplocĕrus montānus*, or big-horn (which see).

Goat Island, a small island of 70 acres, which divides the current of the Niagara River at the Falls. It is connected with the American shore by a bridge.

Goat-moth, a large British moth (*Cossus ligniperda*). The larvæ, which are about 3 inches in length, hollow out galleries in the wood of trees, which they first soften by a juice of a strong smell which they secrete. With the sawdust made in the operation they form cocoons, in which the chrysalids are developed. The larval condition lasts for three years. *C. robiniæ*, the locust-tree carpenter-moth, an American species, expands about three inches, and is gray in color.

Goat's-beard, the general name of plants of the genus *Tragopōgon*, order Compositæ, herbaceous perennials, chiefly natives of Europe. The seeds have feathery appendages; hence the name. The purple goat's-beard (*T. porrifolius*) is cultivated for its root as a table vegetable, known as *Salsify*, and called, in the United States, the oyster plant, its flavor somewhat resembling that of the oyster.

Goat's-rue (*Galēga officinālis*), a leguminous plant indigenous to the south of Europe. It is used as a forage, and is supposed to increase the milk of cows that feed upon it. It is found in North America in dry, sandy soil, from Canada to Florida.

Goat's-thorn, a name given to two hardy, evergreen plants of the genus *Astragălus*. *A. Tragacantha* (great goat's-thorn), and *A. Poterium* (small goat's-thorn). The former, long cultivated in Great Britain, is a native of the south of Europe, the latter of the Levant. There is an American species, *A. Canadensis*.

Goatsucker, a name common to the birds of the genus *Caprimulgus*, as also to all belonging to the same family—the Caprimulgidæ, given originally from the erroneous opinion that they suck goats. The European goat-sucker (*C. Europæus*) feeds upon nocturnal insects, as moths, gnats, beetles, etc., which it catches on the wing, flying with its mouth open. Its mouth is comparatively large, and lined on the inside with a glutinous substance to prevent the escape of those insects which fly into it. Like all birds which catch flies when on the wing, the gape is surrounded by stiff bristles. When perched, it usually sits lengthwise on a bare twig, with its head lower than its tail, and in this attitude utters a jarring note, whence one of its common names—*night-jar*, or *night-churr*. It has a light, soft plumage, minutely mottled with gray and brown, and is about 10 inches in length. The American chuckwill's widow, whip-poor-will, and night-hawk belong to the same family.

Gobelins Manufactory (gob-lan), a tapestry manufactory at Paris, established by Colbert in 1667, on the site of a previously existing manufactory which had been set up by Gilles Gobelin, a celebrated dyer in the reign of Francis I. Colbert collected into it the ablest workmen in the divers arts and manufactures connected with house decoration and upholstery. The Gobelins has since then continued to be the first manufactory of the kind in the world. Many celebrated paintings of the old Italian, French, and Spanish schools have, in the most ingenious manner, been transferred to tapestry.

Gobi (gō'bē), Desert of, the *Shamo* or 'sand-sea' of the Chinese, an immense tract of desert country, occupying nearly the center of the high tableland of Eastern Asia, between lat. 35° and 45° N., and lon. 90° and 110° E., and extending over a large portion of Mongolia and Chinese Turkestan. Its extreme length is probably about 1800 miles; mean breadth, between 350 and 400 miles; area, 300,000 sq. miles. Its general elevation is over 4000 feet above the sea-level. The East Gobi is occupied by different tribes of the Mongolian race, who have numerous herds of camels, horses, and sheep. In the West Gobi are some nomadic tribes of the Tatar race. This tract is supposed at one time to have been a great inland sea.

Goblin (gob'lin), a spirit of popular superstition, generally malignant in nature and grotesque in appearance; much the same as a gnome.

Goby (gō'bi), the general name of a family of acanthopterous fishes (Gobiidæ) characterized as follows:—Two dorsal fins nearly united into one, the anterior fin having flexible rays, not spinous, as is usual in the Acanthopterygians; ventral fins thoracic, and united

more or less by their bases; body scaly, the head unarmed. Like the blennies, they can live for some time out of water. The family is very numerous, about 400 species being known, but does not include any important food fishes. The gobies are among the nest-building fishes, and live among the rocks near the shore.

God, the self-existent, eternal, and Supreme Being, the creator and upholder of the universe, worshiped by most civilized nations. The Christian God is held to be an infinite and absolute being; a perfect personal spirit; eternal; immutable; omniscient; omnipotent; and perfectly good, true, and righteous. The arguments for the existence of God have been divided into the ontological, the cosmological, the psychological, the physico-teleological, and the moral. The ontological argument starts from the idea of God itself, and professes to demonstrate the existence of God as a necessary consequence from that idea. This form of argument is, in some shape or other, a very old one, but was first fully developed and applied by Anselm in the 11th century. The manner in which it was stated by Anselm is this: 'God must be thought of as that being than whom none can be thought greater; but this being the highest and most perfect that we can conceive, may be thought as existing in actuality as well as in thought—that is to say, may be thought as something still greater; therefore God, or what is thought as greatest, must exist not only in thought but in fact.' This argument has been presented in other forms. Descartes, while refuting Anselm's form of the ontological argument, revived it himself in another form. Applying the test of truth which he derived from his celebrated formula—'I think, therefore I am,' that whatever we clearly and distinctly perceive to belong to the true and unalterable nature of a thing may be predicated of it, he found on investigating God that existence belongs to his true and unalterable nature, and therefore may legitimately be predicated of him. Another argument was adduced by Descartes to prove the existence of God, which, although not the same with the ontological argument, appears to resemble it. It is called the psychological argument. Like the ontological argument, it starts from the idea of a supreme and perfect being, but it does not assert the objective existence of that being as implied in its idea, but infers such objective existence on the ground that we could have acquired the idea only from the being which corresponds to it. The cosmological argument starts not from an idea, but from a contingent existence, and infers from it an absolutely necessary being as its cause. Stated syllogistically, the argument is: Every new thing and every change in a previously existing thing must have a cause sufficient and pre-existing. The universe consists of a system of changes. Therefore the universe must have a cause exterior and anterior to itself. The argument called the physico-teleological is that which is commonly known as the argument from design which has been so fully illustrated by Paley in his *Natural Theology*. It is simply this, that in nature there are unmistakable evidences of the adaptation of means to ends, which lead us inevitably to the idea of one that planned this adaptation, that is, of God. The moral argument is derived from the constitution and history of man and his relations to the universe, being based on such considerations as our recognition of good and evil, right and wrong, the monitions of conscience, and the fact that a moral government of the world may be observed. Another argument is based on the (alleged) fact that a belief in the existence of a Supreme Being is everywhere found to be implanted in the breast of man. This argument is used among others by Cicero, and many thinkers are inclined to give a good deal of weight to it; still it is pronounced by others to be at best only a probable argument, if it may be accepted as valid to prove anything at all. Others argue the existence of God from the manifestations which he has made of himself to men, but these, as well as miracles, it is admitted even by Christian theists, can be accepted as real only by such as previously believed in the divine existence.

Godavari (gō-dä'va-rē) a large river of Central India, which rises about 50 miles from the shore of the Indian Ocean, flows across the Deccan from the Western to the Eastern Ghats in a general southeasterly direction, and being joined by several affluents, falls by three principal mouths into the Bay of Bengal, after a course of 900 miles. Before the river divides there are three great obstacles to navigation, caused by three rocky barriers.—GODAVARI is also the name of a British district of the Madras Presidency; area, 7345 sq. miles; pop. 1,791,512. Coringa and Coconada are its chief ports.

Godfrey (god'frē), SIR EDMONDBURY, the magistrate who received the depositions of Titus Oates with regard to the alleged Popish plot, Sept. 28, 1678. He was soon after found dead, pierced with his own sword, though evi-

dently not by his own hand. His death was imputed to the resentment of the papists, and the excitement aroused was the actual cause of the Popish Plot agitation.

Godfrey of Bouillon, leader of the first crusade, son of Eustace II, count of Boulogne, born near Nivelles, 1061; died at Jerusalem, 1100. He distinguished himself while fighting for the Emperor Henry IV in Germany and Italy, and was made Duke of Bouillon. In order to expiate his sin of fighting against the pope, he took the cross for the Holy Land in 1095, and led 80,000 men to the East by way of Constantinople. On the 1st of May, 1097, they crossed the Bosporus, and began their march on Nice (Nicæa), which they took in June. In July the way to Syria was opened by the victory of Dorylæum (Eski Shehr), in Phrygia, and before the end of 1097 the crusaders encamped before Antioch. The town of Antioch fell into their hands in 1098, and in the following year Godfrey took Jerusalem itself, after a five weeks' siege. The leaders of the army elected him king of the city and the territory; but Godfrey would not wear a crown in the place where Christ was crowned with thorns and contented himself with the title of *duke and guardian of the holy sepulcher.* The defeat of the Egyptians at Ascalon placed him in possession of all the Holy Land, excepting two or three places. Godfrey now turned his attention to the organization of his newly-established government, and promulgated a code of feudal laws called the *Assize of Jerusalem.* Godfrey was a favorite subject of mediæval poetry, and is the central figure of Tasso's *Jerusalem Delivered.*

Godfrey of Strasburg, a German poet, who flourished about 1200, was probably born in Strasburg, but at any rate lived there. Besides many lays, we are indebted to him for the great chivalric poem, *Tristan und Isolde,* derived from the legends of the *Round Table.*

Godiva (go-dī'va), the wife of Leofric, earl of Mercia and lord of Coventry in the reign of Edward the Confessor, heroine of a celebrated tradition. In 1040 certain exactions imposed on the inhabitants bore heavily on them, and Godiva interceded for their relief. Leofric, however, only laughed at her, and when she persisted in her entreaties at last said to her, half jocularly, that he would grant her request if she would ride naked through the town of Coventry. Godiva took her husband at his word, proclaimed that on a certain day no one should leave his house before noon, that all windows and other apertures in the houses should be closed, and that no one should even look out until noon was past. She then mounted naked on her palfrey, rode through the town, and returned; and Leofric, in fulfillment of his promise, freed the inhabitants from the burdens he had imposed on them. Only one person, 'Peeping Tom,' the story says, attempted to look out, and he was immediately struck blind. A yearly pageant, in which a young woman enacted the part of Godiva, was long kept up at Coventry, and still occasionally takes place. Tennyson's poem on Godiva is well known.

Godkin (god'kin), EDWIN LAWRENCE, editor, born at Wicklow, Ireland, in 1831; died in New York, 1902. He graduated at Queen's College, Belfast, engaged in journalism and was correspondent of the London *Daily News* during the Crimean war and the American Civil war. He was admitted to the bar in New York in 1858, became editor in 1865 and proprietor in 1866 of *The Nation* and in 1882 of the New York *Evening Post.*

Godna (god'na). See *Revelganj.*

Godolphin (go-dol'fin), SIDNEY, Earl of Godolphin, an English politician, was a native of Cornwall, date of birth unknown, probably 1635. Under Charles II, he was one of those who voted for the exclusion of the Duke of York from the throne in 1680. He nevertheless retained office under that monarch, as he did also under William III, with whom he had long been in correspondence. During the reign of Anne he was appointed lord high-treasurer of England, and in this office did much to improve the public credit, and check corruption in the administration of the public funds. In 1706 he was made Earl of Godolphin, and four years afterwards was obliged to retire from office. His death took place in 1712. He was a man of great business capacity, but his treasonable correspondence with James while he held an office of trust under William of Orange is a serious blot upon his character.

Godoy (go-doi'), MANUEL, Duke of Alcudia, better known as the *Prince of the Peace,* was born at Badajoz, Spain, in 1767; died in 1851. He entered the royal body-guards in 1787. His personal qualities soon made him a favorite at the Spanish court, and his promotion was rapid. In 1791 he became adjutant-general of the guards, in 1792 lieutenant-general, Marquis of Alcudia, grandee of Spain of the first class, and prime-minis-

ter; and in 1795, as a reward for the part he had taken in concluding peace with France, he was presented with a large and valuable landed estate, and made a knight of the Golden Fleece. It was on this occasion also that he was named by the king Prince of Peace. As he used his vast power in the promotion of French more than Spanish interests, he became extremely unpopular, and the hatred of the people became so great in 1808 that he had to take refuge in France. Having lost everything, he lived for a long time only on the bounty of his royal friends. In 1847 he was permitted to return to Spain and resume his titles. The larger portion of his domains, however, was irrecoverably lost, and he ended his days in obscurity and poverty.

God Save the King, the burden and common appellation of a well-known English national song. Concerning the author and the composer opinions differ. It has been attributed to Dr. John Bull, chamber musician to James I; his ode, dating from the gunpowder plot, beginning 'God save great James our King.' But the composition we now possess would seem to have been, both words and melody, the work of Henry Carey (died 1743). It appears to have been first published, together with the air, in the *Gentleman's Magazine* in 1745, when the landing of the young Stuart called forth expressions of loyalty from the adherents of the reigning family. After Dr. Arne, the composer of another national song (*Rule, Britannia*), had brought it on the stage, it soon became very popular. Since that time the harmony of the song has undoubtedly been improved, but the rhythm is the same as originally.

God's Truce, a means adopted by the church in the Middle Ages to check in some measure the hostile spirit of the times, by fixing certain days or periods during which private feuds must cease. This began about the beginning of the eleventh century. The church forbade all feuds from Thursday morning to Monday morning, as these days were consecrated by the death and resurrection of Christ; excommunication being the penalty. Afterwards the whole of Thursday was included, the whole time from the beginning of Advent to the Epiphany, and certain other times of religious import. Hostile encounters were forbidden in the precincts of churches, convents, and graveyards.

Godwin (god'win), EARL OF WESSEX, an Anglo-Saxon noble, born about 990; died 1052. In 1018 he was created an earl by Canute, and married the king's niece Gytha. During the reign of Edward the Confessor, who married Godwin's daughter, a quarrel arose between Godwin and the king, occasioned by the partiality of Edward for Norman favorites, and Godwin was compelled to quit the kingdom. In 1052, however, he returned with an army, forced Edward to enter into negotiations with him, re-established himself triumphantly in his old supremacy, and caused the expulsion from the kingdom of most of the Norman intruders. He was the father of Harold, the last Anglo-Saxon king.

Godwin, MARY, also well known by her maiden name of Wollstonecraft, born in or near London in 1759; died 1797. Her early training was very defective, but fitting herself for a teacher, she set up a school, in conjunction with her sisters, at Islington in 1783. In 1786 she published *Thoughts on the Education of Daughters.* This was followed by an answer to Burke's *Reflections on the French Revolution*, the *Vindication of the Rights of Woman*, and other works. She had peculiar ideas on marriage, and formed a somewhat loose connection with an American of the name of Imlay, whose desertion caused her to attempt suicide. Some time after she fixed her affection on William Godwin (see next art.). As the bonds of wedlock were deemed a species of slavery in her theory, it was only to legitimize the forthcoming fruits of the union that a marriage between the parties took place. She died in giving birth to a daughter, who afterwards became the wife of Shelley, the poet. Among her other works are a *Moral and Historical View of the French Revolution*, and *Letters from Sweden, Norway, and Denmark.*

Godwin, PARKE, journalist, born at Paterson, New Jersey, in 1816; died in 1904. He studied law, but preferred literary pursuits, and for many years was connected with the New York *Evening Post.* He was deputy collector for New York during the Polk administration, edited for a time *The Pathfinder*, and contributed to the *Democratic Review.* He also wrote for and for some time edited *Putnam's Magazine.*

Godwin, WILLIAM, an English novelist and political writer, son of a Dissenting minister, was born in 1756; died 1836. In 1778 he became the minister of a Dissenting congregation near London, and continued in that capacity for five years, after which he removed to London, where he set himself to gaining his livelihood by literary labors. In 1793 appeared his *Inquiry Concerning Political Justice*, the liberal tone of

which exposed him to some danger of a government prosecution. The next year appeared his novel of *Caleb Williams, or Things as They Are*, which rapidly and deservedly attained an immense popularity. He married Mary Wollstonecraft (see preceding art.). A memoir of his wife was published by Godwin in 1798. In 1799 he published a new novel, *St. Leon*. Among Godwin's subsequent works are: *Faulkner*, a tragedy; *Essay on Sepulchers; Mandeville*, a novel; *A Treatise on Population*, in reply to Malthus; *History of the Commonwealth of England; Cloudesley*, a novel; *Thoughts on Man*, and *Lives of the Necromancers*.

Godwinia (god-win'i-a), a genus of plants of the natural order Araceæ. A gigantic species (*G. gigas*) discovered in Nicaragua produces but one very large and very deeply cut leaf supported on a stalk 10 feet long. The inflorescence appears at a different time from the leaf, and consists of a stalk about 10 inches high supporting the spathe or flower 2 feet long, purplish-blue in color, with a carrion-like odor.

Godwit (god'wit), the common name of the members of a genus of grallatorial birds (*Limōsa*), family Scolopacidæ (snipes). There are several European species, among them the common godwit (*L. melanura*) and the red godwit (*L. rufa*). There are besides the great American godwit, the cinereous godwit, the black-tailed godwit, the red-breasted godwit, etc. The common godwit frequents fens and the banks of rivers, and its flesh is esteemed a great delicacy.

Goes (*hōs*), or TERGOES, a fortified town and port in Holland, in province of Zeeland, on the island of South Beveland, 16 miles west of Bergen-op-Zoom. Pop. 6923.

Goethals (gō'thalz), GEORGE WASHINGTON, an American military engineer, born in Brooklyn, New York, June 29, 1858. Graduated at the United States Military Academy and assigned to the corp of engineers in 1880, he became lieutenant-colonel and chief of the volunteer engineers in 1898, and major of the U. S. engineers in 1900. In 1905 he was graduated at the Army War College, and in 1907 became chief engineer of the Panama Canal. President Taft appointed him in 1912 governor of the Canal Zone. He was designated Acting Quartermaster General in December, 1917, by President Wilson during the war.

Goethe (*geu'tè*), JOHANN WOLFGANG VON, the greatest figure in German literature, was born in 1749, at Frankfort-on-the-Main; died at Weimar in 1831. His father, who was a Doctor of Laws and imperial councilor, was a well-to-do citizen and an admirer of the fine arts. The Seven Years' war broke out when Goethe was eight years old, and Count de Thorane, *lieutenant du roi* of the French army in Germany, was quartered in the house of his father. The count, being an amateur and liberal patron of art, encouraged the boy's incipient taste for pictures. At the same time young Goethe learned the French language practically; and a French theatrical company, then performing at Frankfort, awakened his taste for dramatic performances. Drawing, music, natural science, the elements of jurisprudence, and the languages occupied him in succession. After the breaking off of a youthful love affair, which gave a name to the heroine of his great work *Faust* and some features to his *Wilhelm Meister*, he was sent to the University of Leipzig to prepare himself for the legal profession, but he did not follow any regular course of studies. Goethe began at this period, what he practiced throughout his life, to embody in a poem, or in a poetical form, whatever occupied his mind intensely: and no one, perhaps, was ever more in need of such an exercise, as his nature continually hurried him from one extreme to another. In 1768 he left Leipzig, and after an illness of some length he went in 1770 to the University of Strasburg, to pursue the study of law, according to the wish of his father. At Strasburg he became acquainted with Herder—a decisive circumstances in his life. Herder made him more acquainted with the Italian school of the fine arts, and inspired his mind with views of poetry more congenial to his character than any which he had hitherto conceived. While here he fell in love with Frederica Brion, daughter of the pastor of Sesenheim, but the affair, though it made a more abiding impression on him than some others, resulted in nothing. Goethe's numerous love affairs form one of the most curious studies in biography. His attachments were all fugitive; the love passion was continuous, but the object was ever changing. In 1771 he took the degree of Doctor of Jurisprudence, and wrote a dissertation on a legal subject. He then went to Wetzlar to practice law, where he found, in his own love for a betrothed lady, and in the fate of a young man named Jerusalem, the subjects for his striking work, *The Sorrows of Werther*, which formed an epoch in German literature. The attention of the public had already been attracted to him, however, by his drama *Götz von Ber-*

lichingen (published 1773). *Werther* appeared in 1774. Not long after the publication of *Werther*, Charles Augustus, the hereditary duke of Saxe-Weimar, made the acquaintance of Goethe on a journey, and when in 1775 he took the government into his own hands, he invited Goethe to his court. Goethe accepted the invitation, and on the 7th of November, 1775, arrived at Weimar. Wieland was already there, having been the duke's tutor: Herder was added to the band in 1776; Schiller was afterwards one of its members for a few years; and other poets and critics and novelists were gathered round these chiefs. Goethe was the leading spirit of the group even during the last quarter of the eighteenth century, when these men and others were constructing and guiding the literature of all Germany; and his supremacy became yet more absolute afterwards, when for another generation he stood alone. In 1776 he was made privy-councilor of legation, with a seat and vote in the privy-council. In 1782 he was made president of the chamber, and ennobled. In 1786 he made a journey to Italy, where he remained two years, visited Sicily, and remained a long time in Rome. This residence in Italy had the effect of still further developing his artistic powers. Here his *Iphigenia* was matured, *Egmont* finished, and *Tasso* projected. The first of these was published in 1787, the second in 1788, and the third in 1790. In the same year with *Tasso* was published the earliest form of the first part of *Faust*, with the title *Dr. Faust, ein Trauerspiel* ('Dr. Faust, a Tragedy'), a poem in a dramatic form, which belongs rather to Goethe's whole life than to any particular period of it. At the time that Goethe was engaged in the production of these works of imagination he had been pursuing various other studies of a scientific nature with as ardent an interest as if these had belonged to his peculiar province. The result of his studies in botany was a work published also in 1790, *Versuch die Metamorphose der Pflanzen zu Erklären* ('Attempts to Explain the Metamorphosis of Plants'), in which he gives expression to the view that the whole plant, and its different parts, may all be regarded as variously modified leaves. In the following year (1791) he began to apply himself to optics, and in 1791-92 he published a work on this subject called *Beiträge zur Optik*. On the 1st of May, 1791, he became director of the court theater at Weimar. In 1792 he followed his prince during the campaign of the Prussians against the revolutionary party in France, and was present at the battle of Valmy on the 20th of September. At the Weimar theater he brought out some of the dramatic chefs-d'œuvre of Schiller, and there, too, his own dramatic works first appeared, *Götz von Berlichingen*, *Faust*, *Iphigenia at Tauris*, *Tasso*, *Clavigo*, *Stella*, and *Count Egmont*. In 1794-96 Goethe published *Wilhelm Meister's Lehrjahre* ('Wilhelm Meister's Apprenticeship'), a novel which has become well known to English readers through the translation of Carlyle, and which had as a continuation of *Wilhelm Meister's Wanderjahre* (that is, his travels as a journeyman; 1821). His next work of importance was *Hermann und Dorothea* (1797), a narrative poem, in hexameter verse, the characters of which are taken from humble life. In 1806 Goethe married Christiane Vulpius, with whom he lived since 1788, and of whom he always spoke with warmth and gratitude for the degree in which she had contributed to his domestic happiness. In 1808 he published another edition of *Faust* in a considerably altered form. In 1809 was published *Wahlverwandtschaften* ('Elective Affinities'), another novel, and in 1810 the *Farbenlehre* or 'Theory of Colors,' a work in which he had the boldness to oppose the Newtonian theory, and to which Goethe himself attached great importance, although the theory therein promulgated has met with no acceptance among men of science. In 1811-14 appeared Goethe's autobiography, with the title *Aus meinem Leben: Dichtung und Wahrheit;* in 1819 the *Westöstlicher Divan*, a remarkable collection of oriental songs and poems. Goethe's last work was the second part of *Faust*, which was completed on the evening before the last anniversary of his birthday which he lived to see. Goethe's works taken altogether form a rich constellation of poetry, romance, science, art, and philosophy. His greatest production is his *Faust*, emphatically a philosophical dramatic poem, and the best of Goethe's productions in a department for which he seems to have been born. Much light is thrown on Goethe's life and character by the published correspondence with his contemporaries, Herder, Frau von Stein, Lavater, Jacobi, Merck, Countess Stolberg, etc.; by Eckermann's *Conversations*, and especially by his own *Autobiography*, which he himself describes as 'poetry and truth,' and in which probably the truth is sometimes clouded by the poetry. George Henry Lewes's *Life of Goethe* is a standard work both in Germany and Britain.

Gog and Magog. Ezekiel predicts the destruction of Gog and Magog (ch. xxxviii and

xxxix) by the Jews, and mention is also made of them in *Revelation* (ch. xx). Interpreters generally understand them to be symbolical expressions for the heathen nations of Asia. Magog is mentioned as the second son of Japheth in *Genesis* (ch. x, 2). Gog and Magog are also the names given to two reputed giants of early British history, whose statues are erected in the Guildhall in London. These statues are supposed to have been originally made for carrying about in pageants. The present figures of Gog and Magog, which are 14 ft. high, were erected in 1708.

Gogo (gō'go), a town in Bombay Presidency, on the peninsula of Kathiawar, on the Gulf of Cambay, 193 miles N. W. of Bombay. Pop. about 6000.

Gogol (g o'gol), NIKOLAI VASSILJEVICH, a Russian author, born in the province of Poltava in 1809; died 1852. He went to St. Petersburg in 1829 and tried the stage, but failing, found his true vocation in literature. His works are extremely popular in Russia for their graphic and humorous delineation of everyday life and manners, and more especially Russian country life. Among his most notable works are—*Evenings at the Farm* (1832); *Mirgorod*, a collection of tales (1834); the *Dead Souls* (1842), a satirical novel, depicting the public abuses and barbarism of manners prevalent in the provinces; and *Revisor*, a comedy. His later years were tinged with religious mysticism, and he wrote some curious *Confessions*.

Gogra (gog'ra), the chief river of Oudh, forming an important waterway for that quarter of India. It is a tributary of the Ganges; length, 600 miles.

Going, CHARLES BUXTON (1863-), an American engineer and author, born at Westchester, New York. He was editor of the *Engineering Magazine*, and was special assistant to chief ordnance officer, American Expeditionary Forces, in 1918.

Goiter (goi'tẽr), or BRONCHOCELE (bron'ko-sēl), known also in Great Britain as 'Derbyshire neck,' a disease endemic in Derbyshire, Switzerland, some parts of France and South America, and in many other parts of the world, chiefly in valleys and elevated plains in mountainous districts. It is a morbid enlargement of the thyroid gland, forming a soft and more or less mobile tumor or swelling, without any sign of inflammation, on the anterior part of the neck. It sometimes grows to such a size as to hang down over the breast, and respiration and swallowing may be impeded by it, though often it causes little inconvenience. It is regarded as the result of a combination of causes, among which is the drinking of water impregnated with lime or chalk, these substances being ingested with the water. It is treated by giving small doses of the thyroid glands of sheep or by surgical excision.

Gokcha (gok-cha'), GOKTSCHA, a lake in Russian Armenia, occupying a triangular cavity 540 square miles in extent, at an elevation of 6400 ft. above the sea. It receives the water of several streams without having any considerable outlet.

Golconda (g o l-k on'da), a fortress and ruined city of India in the Nizam's dominions, 7 miles W. of Hyderabad. The fort is now used as the Nizam's treasury, and also as a state prison. In former times Golconda was a large and powerful kingdom of the Deccan, but was subdued by Aurengzebe in 1687, and annexed to the dominions of the Delhi empire.

Gold (gōld), a precious metal of a b r i g h t yellow color, and the most ductile and malleable of all the metals; s y m b o l Au (Lat. *aurum*); atomic weight, 196. It is one of the heaviest of the metals, and not being liable to be injured by exposure to the air, it is well fitted to be used as coin. Its ductility and malleability are very remarkable. It may be beaten into leaves so exceedingly thin that 1 grain in weight will cover 56 square inches, such leaves having the thickness of only $\frac{1}{282000}$ th part of an inch. It is also extremely ductile; a single grain may be drawn into a wire 500 feet long, and an ounce of gold covering a silver wire is capable of being extended upwards of 1300 miles. It may also be melted and remelted with scarcely any diminution of its quantity. It is soluble in nitromuriatic acid or *aqua regia*, and in a solution of chlorine. Its specific gravity is 19.3, so that it is about nineteen times heavier than water. The fineness of gold is estimated by carats, pure gold being 24 carats fine. (See *Carat*.) Jeweler's gold is usually a mixture of gold and copper in the proportions of three-fourths of pure gold with one-fourth of copper. Gold is seldom used for any purpose in a state of perfect purity on account of its softness, but is combined with some other metal to render it harder. Standard gold, or the alloy used for the gold coinage of Britain, consists of twenty-two parts of gold and two of copper (being thus 22 carats fine). Articles of jewelry in gold are made of every

degree of fineness up to 18 carats, *i. e.*, 18 parts of gold to 6 of alloy. The alloy of gold and silver is found already formed in nature, and is that most generally known. It is distinguishable from that of copper by possessing a paler yellow than pure gold, while the copper alloy has a color bordering upon reddish yellow. Palladium, rhodium and tellurium are also met with as alloys of gold.

Gold has been found in smaller or larger quantities in nearly all parts of the world. It is commonly found in reefs or veins among quartz, and in alluvial deposits; it is separated, in the former case, by quarrying, crushing, washing, and treatment with mercury. The rock is crushed by machinery, and then treated with mercury, which dissolves the gold, forming a liquid amalgam; after which the mercury is volatilized, and the gold left behind; or the crushed ore is fused with metallic lead, which dissolves out the gold, the lead being afterwards separated by the process of cupellation. By the 'cyanide process,' in which cyanide of potassium is used as a solvent for the gold, low-grade ores can be profitably worked. In placer mining, where the gold occurs in alluvial deposits, it is extracted by washing; either hydraulic methods or, more commonly, dredging being employed.

Gold has been mined since a very early period. Till the discovery of gold in California, in 1848, a chief source of the world's supply was the Ural Mountains in Russia. Rich gold fields were discovered in Australia in 1851. The world's richest gold fields are in the Transvaal and Rhodesia, South Africa. The yield from California has declined, as has the yield from Alaska, which for a few years had a phenomenal output. Colorado surpassed California in its gold output for a number of years, but California took the lead again in 1915. Other gold-producing States are Nevada, South Dakota, Arizona, Montana, Utah, Oregon.

The total output of the United States in 1919 was valued at $58,285,196; Canada, $14,687,000; Australia (not including New Zealand or the islands), $29,268,000; Transvaal, $171,640,123; Rhodesia and West Africa, $18,631,000; India, $10,028,000. Russia (Ural mountains and Siberia) normally produces about $25,000,000; Mexico, $20,000,000; South America, $12,000,000; Central America, $3,000,000. Total world's production in 1919, $350,000,000.

Goldau (gōld'ou), a valley in Switzerland, in the canton of Schwyz, between the Rigi and the Rossberg. It was the scene of a tremendous landslip (2d Sept., 1806) by which a portion of the Rossberg, about 3 miles long, 1000 feet broad, and 100 feet thick, fell in one mass into the valley, burying several villages and killing upwards of 450 persons.

Goldbeater's Skin, a thin membrane prepared from the large intestine of the ox used by gold-beaters and was formerly sometimes used in surgery.

Goldbeating, the art or process of producing the extremely thin leaves of gold used in gilding, etc. The gold is cast into ingots weighing about 2 oz. each, and measuring about ¾ of an inch broad. These ingots are passed between steel rollers till they form long ribbons of such thinness that a square inch will weigh 6½ grains. Each one of these is now cut into 150 pieces, each of which is beaten on an anvil till it is about an inch square. These 150 plates are interlaid with pieces of fine vellum about 4 inches square, and beaten till the gold is extended nearly to the size of the vellum leaves. Each leaf is then divided into four, interlaid with goldbeater's skin, and beaten out to the dimensions of the skin. Another similar division and beating finishes the operation, after which the leaves are placed in paper books ready for use.

Goldberg (gōlt'berg), a town in Prussia, province of Silesia, 14 miles southwest of Liegnitz. The place owes its origin and name to a gold mine in the neighborhood, abandoned since the fifteenth century. Pop. 6804.

Gold Coast, a British crown-colony in W. Africa, comprising that part of the Guinea coast which extends from 3° 30′ w. to 1° 30′ E. lon., stretching inland to an average distance of 50 miles. Estimated area, 15,000 sq. miles. To this has been recently added a protectorate, chiefly from Ashantiland, of about 31,600 sq. miles, and a further region known as the Northern Territories of the Gold Coast, between 8° and 11° N. latitude. The climate is unhealthy. The first settlements on the Gold Coast were made by the Portuguese, who built the fort of Elmina, which was seized by the Dutch in 1637. Subsequently there were a number of Dutch and English settlements established, but the former were transferred to Britain in 1872. The chief towns are Accra, Seccondee, and Cape Coast Castle. The exports include cocoa, gold and gold dust, kola nuts, palm oil, lumber and manganese. The total area of the colony, with Ashanti and protectorate is 80,000 sq. m.; pop. 1,500,000.

Golden Age, that early mythological period in the history of almost all races, fabled to have been one of primeval innocence and enjoyment, in which the earth was common property, and brought forth spontaneously all things necessary for happy existence, while beasts of prey lived at peace with other animals. The Romans referred this time to the reign of Saturn. The so-called 'golden age' of Roman literature is reckoned from the time of Livius Andronicus, 250 B.C., to the death of Augustus Cæsar, A.D. 14.

Golden Beetle, the popular name of several tetramerous beetles of the genus *Chrysoměla*. Their most obvious characteristic is the great brilliancy of their color. There are none of large size. Among species found in the United States is the Ladder Beetle.

Golden Bull, an important document in the history of Germany issued by the Emperor Charles IV in 1356. Its immediate object was to regulate for all time coming the mode of procedure in the election and coronation of the emperors.

Golden Calf, an image cast by Aaron from the earrings of the people for the worship of the Israelites while encamped at the foot of Mount Sinai. Two similar idols were set up by King Jeroboam, centuries later, one in Dan, the other in Bethel.

Golden-Crested Wren, GOLDEN-CRESTED REGULUS, or KINGLET (*Regŭlus cristātus*), a beautiful bird belonging to the family Sylviadæ, distinguished by an orange crest. It is the smallest of British birds, being only about 3½ inches in length, is very agile, and almost continually in motion.

Golden Eagle. See *Eagle.*

Golden-eye, *Clangŭla vulgāris*, a species of wild duck. See *Garrot.*

Golden Fleece, in classical mythology, the fleece of gold in quest of which Jason undertook the Argonautic expedition to Colchis. The fleece was suspended in an oak tree in the grove of Ares (Mars), and was guarded by a dragon. When the Argonauts came to Colchis for the fleece, Medea put the dragon to sleep and Jason carried the fleece away. See *Argonauts, Jason, Medea.*

Golden Fleece, ORDER OF THE, the *Toison d'or*, a military order instituted by Philip the Good, Duke of Burgundy, in 1429, on the occasion of his marriage with the Portuguese princess, Isabella. The order now belongs to both Austria and Spain. The knights carry suspended from their collars the figure of a sheep or fleece in gold.

Golden Gate, the entrance from the Pacific Ocean to the harbor of San Francisco, a waterway about 5 miles long and 1 mile wide and with a strikingly beautiful and picturesque setting.

Golden Horde, originally the name of a powerful Mongol tribe, but afterwards extended to all the followers of Genghis Khan, and of Batu, the grandson of Genghis Khan, who invaded Europe in the thirteenth century. Under Batu the Golden Horde advanced westwards as far as the plain of Mosi in Hungary, and Liegnitz in Silesia, at both of which bloody battles were fought in 1241. They founded the empire of the Kiptshaks, or the Golden Horde, which extended from the banks of the Dniester to the Ural, and from the Black Sea and the Caspian to the mouth of the Kama and the sources of the Khoper. This empire lasted till towards the close of the fifteenth century, when it was overthrown by Ivan III.

Golden Horn, the harbor of Constantinople, an inlet of the Bosporus, so called from its shape and beauty.

Golden Legend (*Aurea Legenda*), a collection of legends of the Saints made in the 13th century by Jacobus de Voragine, archbishop of Genoa (died 1298). It consists of 177 sections, each of which is devoted to a particular saint or festival, arranged in the order of the calendar. Caxton printed a translation in 1483, and another edition was produced by Wynkyn de Worde in 1498.

Golden Number, in chronology a number showing the year of the moon's cycle; so called from having formerly been written in the calendar in gold. To find the golden number add 1 to the given year, and divide the sum by 19, what remains will be the number required, unless 0 remains, for then 19 is the golden number.

Golden Pheasant. See *Pheasant.*

Golden-rod (*Solidāgo*) is a genus of plants, natural order Compositæ, chiefly natives of North America, and abundant in many parts of the United States. Most of the species have erect, rod-like, scarcely-branched stems, with alternate serrated leaves and terminal spikes or racemes of small, yellow flowers. They flower in the late summer and early autumn.

Golden Rose, in the Roman Catholic Church an ornament of gold consecrated by the pope on the fourth Sunday of Lent. It was originally a single flower of wrought gold, colored red; afterwards the golden petals were decked with rubies and other gems; finally the form adopted was that of a thorny branch, with several flowers and leaves, and one principal flower at the top, all of pure gold. It is sent to some favored prince, some eminent church, or distinguished personage.

Golden Rule, the rule laid down by Jesus in the Sermon on the Mount: 'Therefore all things whatsoever ye would that men should do to you, do you even so to them.'

Golden Saxifrage, the popular name for plants of the genus *Chrysosplenium*, a small genus of Saxifragaceæ, consisting of annual or perennial rather succulent herbs, with alternate or opposite crenate leaves, and inconspicuous greenish axillary and terminal flowers. They are natives of Central and Northern Europe, the Himalayas, and parts of America.

Goldfinch, a common European bird, the *Fringilla carduēlis*, belonging to the Finch family. It is about five inches in entire length, black, scarlet, yellow, and white being beautifully mingled in its plumage. The colors of the female are duller than those of the male. Its brilliant plumage, soft and pleasant song, and docility make it a favorite cage-bird. The black-headed goldfinch, native of South America, and accidental in the United States, has a black head.

Golden Wedding, the 50th anniversary of a wedding, in which it is understood that the presents given to the married couple shall all be of gold.

Goldfish, the trivial name of a beautiful species of carp, found in the fresh waters of China. It is greenish in color in the natural state, the golden yellow color being found only in domesticated specimens, and retained by artificial selection. These fishes are reared by the Chinese in small ponds, in basins, or porcelain vessels, and kept for ornament. By careful selection, many strange varieties and monstrosities have been propagated. They are now distributed over nearly all the civilized parts of the world, but in large ponds they readily revert to the color of the original stock.

Gold Lace, a fabric woven of silken threads which are either themselves gilt or are covered with fine gilt silver wire. In the former the gold-leaf is fixed directly on the threads by means of a gum. In the latter finer kind the fine gilt silver wire is twisted compactly round the silk threads, which are then ready for being manufactured into lace.

Gold Leaf, one of the forms in which gold is applied for the purpose of gilding. It is prepared by a prolonged beating out of the metal between sheets of vellum and thick skin. A preliminary fusion at a high temperature serves to increase the malleability of the gold. After beating the leaves are placed in books holding twenty-five. The leaves are about three and a quarter inches square and are produced in ten different shades of color, according as the gold was alloyed with much or little cooper or silver.

Goldmark (gōld'märk), KARL, an Austrian musical composer, born at Keszthely, Hungary, in 1830; died in 1915. *The Queen of Sheba*, produced at the Court Opera in 1875, brought him wide recognition, but he is best known by his symphony, *The Rustic Wedding*, and his overture, *Sakuntala*. Other works include a short opera, *The Cricket on the Hearth*, and *Merlin*.

Gold of Pleasure, the *Camelina sativa*, a cruciferous annual, with arrow-shaped leaves and terminal racemes of yellow flowers. It is cultivated to a considerable extent in Europe for its seeds, which are fed to cattle, and also yield a useful oil.

Goldoni (gol-dō'nē), CARLO, a celebrated Italian writer of comedies, born at Venice in 1707; died at Paris 1793. He settled as an advocate in Venice, but shortly took to a wandering life with strolling players, until in 1736 he married the daughter of a notary and settled down in Venice. Here he first began to cultivate that department of dramatic poetry in which he was to excel; namely, description of character and manners. After this he took Molière for his model. In 1761 the Italian players invited him to Paris, where many of his pieces met with uncommon applause. He became reader and master of the Italian language to the daughters of Louis XV; and for a time received a pension. His best known works include *La Bottega di Caffè*, *La Baruffe Chiozzotte*, *I Rusteghi*, *Todero Brontolon*, *Gli Innamorati*, *Il Ventaglio*, *Belisario*, *Momolo Courtesan*, *La Notte Critica*, *La Bancarotta*, *La Donna Di Garbo*, *L'Impostore*, *Locandiera*, *La Famela* and *Dama Prudente*. His autobiography appeared in 1787.

Goldsboro (gōldz'bo-ro), a city of North Carolina, capital of Wayne County, 49 miles S. E. of Raleigh. It is of importance as a railroad center, and has manufactures of carriages, machinery, mattresses, furniture, cotton, boxes, etc.; also oil and rice mills, woodworking establishments, etc. Pop. (1910) 6107; (1920) 11,296.

Goldschmidt (golt'shmit), MEIER AARON, a Danish novelist, born of Jewish parents in 1819; died 1887. In 1840 he founded what became the most famous of Danish newspapers, *The Corsair*, celebrated for its brilliant wit and audacious satire. In 1845 he published his first novel, *A Jew*, which was translated into English and several other European languages. In 1847 he published a collection of short stories, and began the issue of another newspaper, *North and South*. His chief novels are *Homeless*, *The Heir*, *The Raven*, and *The Vacillator*. He also published a series of short stories of Jewish life, and a play, *The Rabbi and the Knight*. His style is said to be the most graceful in the language.

Goldsmith (gold'smith), OLIVER, poet and miscellaneous writer, born in 1728, at Pallas, County Longford, Ireland; died in London in 1774. His father, a clergyman of the Established Church, held the living of Kilkenny West. In 1745 he was entered as a sizar at Trinity College, Dublin. In 1749, shortly after his father's death, he quitted Dublin with the degree of bachelor, and was advised by an uncle who had already borne a large part of the expenses of his education, to prepare for holy orders. Rejected for holy orders, he became tutor in a family, but soon lost his situation on account of a dispute with the master of the house over a game at cards. The same uncle who had given him assistance before now gave him £50 to go to Dublin to study law, but he had scarcely arrived at the city when he lost the whole sum in gambling. In spite of his repeated imprudences he was once more succored by his uncle, who supplied him with means to go to Edinburgh to study medicine. Here he remained eighteen months, during which he acquired some slight knowledge of chemistry and natural history. At the end of this period he removed to Leyden, again at the expense of his uncle; and afterwards wandered over a large part of France, Germany, Switzerland, and Italy. It was probably at Padua that he took a medical degree, as he remained there six months; but his uncle dying while he was in Italy he was obliged to travel on foot to England, and reached London in 1756 with a few pence in his pocket. After some years of hard experience as a chemist's assistant, medical practitioner, proofreader, and school usher, he drifted into literature. He conducted a department in the *Monthly Review*, wrote essays in the *Public Ledger* (afterwards published under the title of the *Citizen of the World*), and a weekly pamphlet, entitled the *Bee*. In 1761 he was introduced to Dr. Johnson. In 1764 he appeared as a poet by the publication of his *Traveler*. In 1766 appeared his *Vicar*

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of Wakefield, which at once secured merited applause. In 1768 his comedy of the *Good-Natured Man* was acted at Covent Garden with but indifferent success. His poetical fame was greatly enhanced by the publication of his *Deserted Village*, in 1770. In 1773 he produced his comedy of *She Stoops to Conquer*, which was completely successful. He also compiled histories of England, Greece, and Rome; and a *History of the Earth and Animated Nature*, a pleasing work, but one of no scientific value. His last days were embittered by the pressure of debt, incurred partly by his improvidence and partly by his generosity. The manners of Goldsmith were eccentric, even to absurdity. As a poet, his *Traveler* and *Deserted Village* have given him a deserved reputation; and his *Vicar of Wakefield* is one of the best known and most delightful of English novels.

Gold Wire, an ingot of silver superficially covered with gold, and drawn through a great number of holes of different sizes until it is brought to the requisite fineness.

Golf, a game played with clubs and balls, over a tract of ground called links, a full course comprising 18 holes, ranged at distance varying from 166 to 600 yards from each other, and usually totalling a distance of about 6000 yards. [Courses comprising fewer holes are also laid out where the tract of ground is too small for the full number of holes.] The clubs are of different uses, and have different names according to the purpose for which they are respectively designed; as the *driver, brassie, putter, mashie, mid-iron, cleek, niblick* and *jigger.* The rival players are one on each side, which is called a two-some, or two against two, called a four-some. The object of the game is, starting from the first 'tee,' where the ball is put in place, to drive the ball into the first hole with as few strokes as possible, and so on with all the holes in succession, the side which holes its ball on any occasion with the fewest strokes being said to gain the hole. The match is usually decided by the greatest number of holes gained in one or more rounds, called match play, or the aggregate number of strokes taken to 'hole' one or more rounds, called medal play.

Mid-Iron.

Golgotha (gol'gō-tha). See *Calvary.*

Goliath (go-lī'ath), giant of Gath slain by David (1 Sam., xvii); His height was 'six cubits and a span,' which, taking the cubit at 21 inches, would make him a little over 11 feet. The Septuagint and Josephus read, '*four* cubits and a span.'

Goliath Beetle, the popular name of the beetles of the genus *Goliăthus,* natives of Africa and South America, remarkable for their large size, and on account of their beauty and rarity much prized by collectors. There are several species, as *G. cacicus* (goliath beetle, proper), *G. polyphēmus, G. micans,* etc. *G. cacicus,* a South American species, is roasted and eaten by the natives of the district it inhabits, who regard it as a great dainty. It attains a length of 4 inches.

Gollnow (gol'no), a town in Prussia, 14 miles northeast of Stettin. Pop. 8539.

Goloshes (gu-losh'es), a word introduced into our language from the French *galoche,* but originally derived from the Spanish *galocha,* meaning a wooden shoe or clog. It was formerly applied by the English to a kind of wooden clogs. The name is now restricted to overshoes, now generally made of vulcanized India rubber.

Gomarites (gō'mar-itz), GOMARISTS, followers of *Francis Gomar,* a Dutch disciple of Calvin in the seventeenth century. The sect, otherwise called Dutch Remonstrants, very strongly opposed the doctrines of Arminius, adhering rigidly to those of Calvin. See *Reformed Church.*

Gombroon (gom'brön), another name for *Bender Abbas,* which see.

Gomera (gō-mā'ra), one of the Canary Islands, about 12 miles by 9 in extent; pop. 15,358. It has two towns, St. Sebastian and Villa Hermosa.

Gomez (gom'ez), MAXIMO, a Cuban patriot, born in Barri, San Domingo, in 1838; died in Cuba in 1905. He served as a lieutenant in the Spanish army sent to occupy San Domingo and won distinction in the battle of San Lome. After San Domingo won its freedom he went with the Spanish troops to Cuba, where, becoming incensed at the actions of the government toward the peasants, he left the army and joined the patriots, becoming an able and successful leader in the war of 1868-78. He was promoted major-general and afterwards made commander-in-chief of the patriot army. In the revolt of 1895 he again joined the Cuban insurgents, and fought with distinction till the Americans occupied Cuba. In 1899 he was given a reception and banquet in Havana by the United States military authorities.

Gomez (go'mez), SEBASTIANO, a Spanish painter, born at Seville about 1616; died about 1690. He was originally a slave of Murillo, but on account of his genius he was liberated by his master and received and taught among his pupils.

Gomorrah (go-mor'a). See *Sodom.*

Gompers (gom'pers), SAMUEL, labor leader, born in London in 1850, came to the United States in 1863. Here he became a cigarmaker, early took part in the organization of workingmen, and was one of the founders of the American Federation of Labor, and editor of the *American Federationist.* In 1882 he became president of the Federation, which position he still retains. As such he is a power in the labor world, the

Federation including over a hundred national and international labor unions. On the entrance of the United States into the European War in 1917 he was selected as one of the six members of the Advisory Commission of the Council of National Defense. He gave himself enthusiastically and successfully to the healing of the differences between capital and labor so as to insure a successful prosecution of the war. It was due largely to him that industrial peace was maintained while the country was at war. He declined to meet the Germans who invited him to attend a conference of the German Federation of Trade Unions to discuss peace. Instead, he visited Great Britain and other Allied countries, meeting the representatives of labor and inspiring them with his own ardor and discouraging any attempts to dicker with the enemy.

Gomul Pass (go-mul'), a pass across the Sulaimán range, from the Punjab into Afghanistan. It follows the course of the Gomul River, and is an important trading highway.

Goncourt (gon-kör), the name of two French novelists, brothers, EDMOND DE (1822-96) and JULES DE (1830-70), the first born at Nancy, the second at Paris. Their first literary efforts were in the field of history, but they are best remembered for their work in the French realistic school of fiction. Chief among their novels are *Charles Demailly* (1860), *Sœur Philomène* (1861), *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), *Manette Salomon* (1867) *and Madame Gervaisais* (1869). The following studies by Edmond alone are also important: *L'Art au XVIII e Siècle* (1874), *L'Oeuvre de Watteau* (1876), *L'Oeuvre de Prudhon* (1877).

Gonaives (gō-na-ēv'), a town on the west coast of Hayti, on the bay of the same name, 65 miles N. N. W. of Port au Prince. It has an excellent harbor. The exports are cotton, coffee, salt and mahogany. Pop. about 18,000.

Gonda (gon'da), chief town of district of the same name, Oudh, India, 28 miles N. N. W. of Fryzábád. Pop. about 15,000. The district has an area of 2881 sq. miles.

Gondar (gon'dăr), a chief town of Abyssinia, formerly the residence of the king, and still the ecclesiastical headquarters, is situated on a hill of considerable height, about 22 miles north of Lake Dembea. The town is divided into several quarters; contains many churches, and the ruins of a magnificent towered castle, built in the sixteenth century by Indian architects under the direction of Portuguese settlers. It was burned by King Theodore in 1868. Pop. 6000.

Gondokoro (gondo-kō'ro), formerly a trading and missionary station and military port on the Bahr el Abiad or White Nile, lat. 4° 55′ N.; for a time the chief seat of the Egyptian government of the Upper Nile, and important as a center of the ivory and slave trade, but now deserted during most of the year, though it still has an ivory trade.

Gondola (gon'du-la), a sort of barge, curiously ornamented, and navigated on the canals of Venice. The middle-sized gondolas are upwards of 30 feet long and 4 broad; they always terminate at each end in a very sharp point, which is raised perpendicularly to the height of a man. Near the center is a curtained chamber for passengers. The boatman is called *gondolier*.

Gonds, the aboriginal or rather non-Aryan inhabitants of the old territorial division of Hindustan called Gondwana, corresponding pretty nearly to what is now called the Central Provinces. After a long period of repression, they attained to a position of great prominence and power, and in the sixteenth, seventeenth, and eighteenth centuries three Gond dynasties simultaneously held almost the whole Gondwana under their sway. With a rise of the Mahrattas the power of the Gonds declined, and in 1781 the last of their dynasties was overthrown and the independence of the Gonds ceased. Their numbers have been variously estimated up to 2,000,000, partly under feudatory states and partly under the British government, in the Central Provinces.

Gondwana (gund-wä'na), an extensive, imperfectly defined tract of Central India. See *Gonds*.

Gonfalon (gon'fa-lon), an ensign or standard; especially an ensign having two or three streamers or tails, fixed on a frame made to turn like a ship's vane, or, as in the case of the papal gonfalon, suspended from a pole similarly to a sail from a mast. The person entrusted with the gonfalon in many of the mediæval republican cities of Italy was often the chief personage in the state.

Gong, a Chinese musical instrument made of an alloy of copper (about seventy-eight parts) and tin (about twenty-two parts), in form like a round flat dish with a rim two to three inches in depth. It is struck

by a kind of drumstick, the head of which is covered with leather, and is used for the purposes of making loud, sonorous signals, of marking time, and of adding to the clangor of martial instruments.

Gongora y Argote (gon-go'ra ar-go'tē), LUIS, a celebrated Spanish poet, was born at Cordova in 1561; died there in 1627. He was educated for the church, and was made chaplain to the king, and a prebendary in the cathedral of Cordova. His works consist chiefly of lyrical poems, in which he excelled. He introduced a new poetic phraseology called the *estilo culto*, and founded a school of writers, the *Gongoristas*, who carried this depraved style to an absurd length.

Gonidia (gon-id'i-a), the name given to the secondary, reproductive, green, spherical cells in the thallus of lichens, forming the distinctive mark between those plants and fungi.

Goniometer (gō-ni-om'e-tėr), an instrument for measuring solid angles, particularly the angles formed by the faces of crystals. The *reflecting goniometer* is an instrument of this kind for measuring the angles of crystals by determining through what angular space the crystal must be turned so that two rays reflected from two surfaces successively shall have the same direction.

Gonorrhœa (gon-o-rē'a), a specific contagious inflammation of the male urethra or the female vagina, attended, from its early stages, with a profuse secretion of much mucus intermingled with pus. This secretion contains the germ of the disease. Though termed a venereal disease, it is totally distinct from syphilis. It is a painful disease, and may result in the chronic catarrh called gleet, or may lead to stricture and other serious evils in the male and inflammation of uterus, Fallopian tubes, ovaries, or peritoneum in the female, necessitating various excision operations and perhaps resulting in permanent invalidization of the person affected. Various other complications may occur in both sexes, and carelessness on the part of the sick may result in gonorrhœal inflammation of the eyes, which is very likely to cause blindness. Sterility may result in both sexes.

Gonsalvo (gon-sal'vo), HERNANDEZ Y AGUILAR, DE CORDOVA, a Spanish soldier, called the *great captain* (*el gran capitan*), was born at Montilla, near Cordova, in 1453; died at Granada, 1515. He distinguished himself in the Portuguese war which began in 1475, and in the great war with the Moors, which ended with the conquest of Granada in 1492. In 1495 he was sent to assist Ferdinand II, King of Naples, against the French, who occupied the whole of that kingdom. In less than a year Gonsalvo drove the French over the Neapolitan frontiers, and returned to Spain, where he was engaged in subjecting the Moors in the Alpujarras, when Louis XII of France renewed the war against Naples. Gonsalvo again took the field, and by the victory near Seminara in 1502 obtained possession of both Calabrias. In 1503 he gained a still more important victory near Cerignola, in consequence of which Abruzzo and Apulia submitted, and Gonsalvo marched into Naples. He then sat down before Gaëta. As the siege was protracted, he gave up the command to Don Pedro Navarro, and advanced to meet the enemy. He defeated the Marquis of Mantua; and on the Garigliano, with 8000 men, obtained a complete victory over 30,000 French, the consequence of which was the fall of Gaëta. The possession of Naples was now secured. He was viceroy in Italy until 1507, when, through the jealousy of the king and the calumnies of the courtiers, he was deprived of his office. He thereupon retired to Granada, at which place he died.

Gonzaga Family (gon-zä'gä), a famous Italian family who ruled over Mantua for over three centuries. Many illustrious soldiers, statesmen, churchmen, and promoters and cultivators of arts, science, and literature sprang from this stock. They became extinct in 1708.

Good, JAMES ISAAC, an American theologian, born at York, Pennsylvania, in 1850. Studied at Union Theological Seminary; was ordained to the German Reformed ministry, 1875, and held several pastorates. He was successively professor of church history (1890–93) and dean of the theological seminary (1893–1907) at Ursinus College, Philadelphia; and professor of Reformed Church history in the Central Theological Seminary, Dayton, Ohio. He has published several works, including a *History of the Reformed Church in Germany and in the United States.*

Goodale (good'āl), GEORGE LINCOLN, botanist, born at Saco, Maine, in 1839. He became a lecturer in medical schools in Maine, in 1870 professor of natural sciences in Bowdoin College; in 1882 instructor in botany in Harvard; later professor; and in 1888 Fisher professor of natural history; ex-

rator of botanical museum, 1879-1909; since honorary curator.

Goodall (good'al), EDWARD, line-engraver, born at Leeds, England, in 1795. He was self-taught, and early in his career attracted the notice of Turner, a number of whose pictures he engraved, including the large plates of Tivoli and Cologne, and various plates in the England and Wales and Southern Coast series. He also engraved many plates for the annuals, and the largest number of the landscapes after Turner that illustrate the elegant editions of Rogers's *Italy* and *Poems*. He engraved a number of plates for the *Art Journal*, several from pictures by his son, Frederick Goodall, of which the *Cranmer at the Traitors' Gate* and the *Happy Days of Charles I*, both of large size, are the most important. He died in London in 1870.

Goodall, FREDERICK, an English painter, son of Edward Goodall, the engraver; born in London in 1822; died in 1904. At seventeen years of age he began to exhibit, and produced pictures very varied in subject and generally of high excellence. He was elected A. R. A. in 1853, and R. A. in 1863. Exemplifying variety, the following may be named; *Raising the Maypole in the Olden Time* (1851), *Cranmer at the Traitors' Gate* (1856), *The Opium Bazaar, Cairo* (1863), *Mater Purissima and Mater Dolorosa* (1868), *The Subsiding of the Nile* (1873), *The Holy Mother and Child* (1876), *The Flight into Egypt*, and *A New Light of the Harem* (1884).

Goode, GEORGE BROWN, ichthyologist, born at New Albany, Indiana, in 1851; died in 1896. He studied in the Harvard Museum of Comparative Anatomy, and from 1874 till his death was connected with the Fish Commission and the National Museum. Became assistant secretary of the Smithsonian Institution in 1887. He wrote *The Fishes of Bermuda, A History of the Menhaden, Game Fishes*, and *Food Fishes* of the United States, etc.

Good Friday, a fast of the Christian Church in memory of our Saviour's crucifixion, kept on the Friday of Passion Week, that is, the Friday before Easter. It has been celebrated from a very early period. In the Roman Catholic Church the celebration of this fast includes prayers for all classes of people, including heretics, schismatics, pagans, and Jews, and the 'Adoration of the Cross,' but no mass is celebrated. In nearly all Protestant churches the day is observed, and special religious services are held. The practice of eating hot 'cross-buns' on this day has now no religious significance.

Good Hope, CAPE OF. See *Cape of Good Hope*.

Goodnow (good'nō), FRANK JOHNSON, an American educator, born in Brooklyn, New York, January 18, 1859. He was graduated from Amherst in 1879 and from the Columbia Law School in 1882. He was instructor or professor in administrative law and municipal science at Columbia, 1883–1914; collaborated with James Bryce in the preparation of *The American Commonwealth* and was chosen by China as her constitutional adviser. In 1914 he was elected president of Johns Hopkins University.

Goodrich (good'rich), SAMUEL GRISWOLD, author, born at Ridgefield, Connecticut, in 1793; died in 1860. He was a publisher in Hartford and afterwards in Boston. He is best known as 'Peter Parley,' a pseudonym assumed in writing, editing, and compiling children's books. During President Fillmore's administration he acted as American consul at Paris. He wrote *Recollections of a Lifetime: Sketches from a Student's Window*, etc.

Goods and Chattels, the legal and popular denomination for personal property as distinguished from things real, or lands, tenements, or hereditaments.

Good Templars, INDEPENDENT ORDER OF, a temperance brotherhood which combines the principles of teetotalism with certain mystic rites, imitated less or more from freemasonry, having secret signs, passwords, and insignia peculiar to itself. It originated in New York in 1851, and extended to Britain in 1868.

Good-will, the benefit derived from a business beyond the mere value of the capital, stock, funds, or property employed in it, in consequence of the general public patronage and encouragement which it receives from constant and habitual customers. It has legally considered a subject of sale along with the stock, premises, fixtures, trade debts, etc.

Goodwin Sands, certain dangerous sandbanks, about 4 or 5 miles off the east coast of Kent.

Goodyear (good'yēr), CHARLES, inventor, was born in New Haven, Connecticut, in 1800. For many years he experimented with India rubber, to form from it a solid elastic material, and in 1844 obtained his first patent. He endured great privations in his efforts, even after he had succeeded in hardening rubber by the addition of sulphur, and,

although winning the grand prize in the London and Paris World's fairs of 1851 and 1855 and the cross of the Legion of Honor, he died in poor circumstances in 1860.

Goole (göl), a town and river-port of England, county of York (West Riding), on the Ouse, 23 miles west by south of Hull. The town dates from 1829, when it became a bonding port, and it has a good shipping trade. Besides the tidal basin a series of large and commodious docks have been constructed. The exports are chiefly coal, machinery, and woolen goods. Ship and boat building, sailmaking, iron-founding, artificial manure and agricultural machine making are carried on to some extent. Pop. (1911) 20,334.

Goorkhas (gör'kas), the mountaineers of Nepaul, Northern India, with whom a good understanding with the British exists. They now freely enter the native army, and are amongst the most faithful and courageous of the Indian troops, having particularly distinguished themselves in the battles of the Satlej in 1845-46, during the mutiny of 1857, in the war with Afghanistan in 1878-79, and in the short Egyptian campaign of 1882. They are Hindus in religion.

Goosander (gö-san'der; *Mergus*), a genus of migratory natatorial birds, characterized by a beak thinner and more cylindrical than that of the ducks, and having each mandible armed at its margins with small, pointed teeth, directed backward like a saw, the upper mandible being curved down at its extremity; there are about seven species. *M. Merganser*, the goosander or merganser proper weighs about 4 lbs. It is an Arctic bird, moving south in winter, and in severe seasons frequents the lakes and rivers of Britain. It feeds principally on fish, which it seizes by rapid diving. The *M. serrātor*, the red-breasted goosander, measures about 21 inches in length, and weighs about 2 lbs. The *M. cucullātus* is the hooded goosander peculiar to North America.

Goose (gös), the common name of the birds belonging to the family Anseridæ or Anseres of earlier authors, a well-known family of natatorial birds. The domestic goose lives chiefly on land and feeds on grass; there are many varieties, but they do not differ widely from each other. It is valued for the table, and on account of its quills and fine soft feathers. The common wild goose, or grey-lag, which is migratory, is the *Anser ferus*, and is believed to be the original of the domestic goose. The Snow-goose (*A. hyperboreus*) of North America is 2 feet 8 inches in length, and its wings are 5 feet in extent. The bill of this bird is very curious, the edges having each twenty-three indentations or strong teeth on each side. The inside or concavity of the upper mandible has also seven rows of strong, projecting teeth, and the tongue, which is horny at the extremity, is armed on each side with thirteen long and sharp bony teeth. The flesh of this species is excellent. The *Laughing* or *White-fronted Goose* (*A. albifrons*) inhabits the northern parts of both continents, and migrates to the more temperate climates during the winter. The *bean-goose* (*A. segĕtum*) is also common to both continents. The *Canada goose* (*A.* or *Cygnopsis Canadensis*) is the common wild goose of the United States, and is known in every part of North America. It is also found in Europe. Other species are the *bernicle goose* and the *brent goose* (which see), the *dusky goose* (*A. rufescens*) and the *pink-footed goose* (*A. brachyrhynchus*).

Gooseberry (gös'ber-i; *Ribes grossularia*), a low, branching shrub, growing wild in Siberia and the north of Europe, other species being found in North America. Along with the currants it forms the order Grossulariaceæ, which is now usually combined with Saxifragaceæ. The branches are armed with numerous prickles, and bear three to five lobed leaves and inconspicuous flowers. The fruit is a succulent berry, very wholesome and agreeable, of various colors—whitish, yellow, green, and red. Gooseberries are popular fruits for preserving, and are extensively cultivated, being of very easy culture. They may be raised from slips, which is the usual mode of perpetuating varieties; new varieties are raised from seed. The plant of four years old produces the largest and finest fruit; afterwards the fruit becomes smaller, but increases in quantity. *R. niveum*, an American species, has fine white flowers, and is cultivated as an ornamental shrub.

Goosefish, the Angler (which see).

Goosefoot (*Chenopodium*) is a genus of plants, nat. order Chenopodiaceæ, indigenous to the temperate parts of the eastern continent. They are weedy plants common in waste places, and bear small, greenish flowers, which are sessile in small clusters, collected in spiked panicles. *C. botrys*, the Oak of Jerusalem, is found in sandy fields from New England to Illinois. The seeds of *C. quinoa* of Peru are used as food. See *Quinoa*.

Goosegrass. See *Cleavers.*

Gopher (gō'fer), the name of various burrowing animals, natives of North America. The *Geomys bursarius*, or pouched rat, has large cheek-pouches extending from the mouth to the shoulders, incisors protruding beyond the lips, and broad, mole-like forefeet. Several American burrowing squirrels also get this name, as *Spermophilus Franklinii*, *S. Richardsonii*, etc.; as also a species of burrowing land-tortoise of the Southern States, whose eggs are valued for the table.

Gopher-wood, the wood of which Noah's ark was built. The name does not convey to us any idea of what species of wood is meant.

Göppingen (geup'ing-en), a town of Würtemberg, 22 miles E. S. E. Stuttgart. It is regularly built; contains a handsome church, town-house, old castle, and hospital; and has a mineral spring; manufactures of woolen and linen cloth, hats, paper, etc. Pop. (1905) 20,870.

Gorakhpur (gō-ruk-pör'), a town of Hindustan, Northwest Provinces, division of Benares, capital of the district of same name, on the left bank of the Rapti. It has considerable trade in grain and timber, sent down the Rapti to the Gorgra and the Ganges. Pop. 64,148.—The district has an area of 4598 square miles. It is generally flat, and traversed by numerous streams, of which the principal are the Rapti and larger Gandak.

Goramy, GOURAMI (gō-ra-mī', gō-ra-mī'), the Javanese name of a fish of the genus *Osphroměnus* (*O. olfax*), family Anabasidæ or climbing perches, a native of China and the Eastern Archipelago, but introduced into the Mauritius, West India Islands, and Cayenne on account of the excellence of its flesh, where it has multiplied rapidly. It is deep in proportion to its length, and the dorsal and anal fins have numerous short spines, while the first ray of the ventral is protracted into a filament of extraordinary length. It is one of the few fishes which build nests, which it does by interweaving the stems and leaves of aquatic plants.

Gordiacea. See *Nematelmia.*

Gordian Knot. See *Gordius.*

Gordianus (gor-di-ā'nus), M. ANTONIUS, the name of three Roman emperors, father, son, and grandson, Anglicized as *Gordian.* The first was born in 158 A.D., and had governed Africa for many years, when he was proclaimed emperor at the age of eighty. He associated his son with him in the empire, but six weeks later the son was killed in fighting against the rival emperor Maximinus, and the father, in an agony of grief, died by his own hand. The grandson was proclaimed emperor by the soldiers in Rome 238 A.D., although he was not more than fifteen years of age. He reigned six years, when he was assassinated by his soldiers at the instigation of Philip, prefect of the Prætorian guard.

Gordius (gor'di-us), in Greek legend, a Phrygian peasant, father of Midas, who was raised to the Phrygian throne in accordance with an oracle which declared to its Phrygian consulters that their seditions would cease if they elected as king the first man they met, mounted on a chariot, going to the temple of Zeus. This was Gordius, who, to evince his gratitude, consecrated his chariot to Zeus, and fastened the pole with so ingenious a knot that the oracle promised the dominion of the world to him who should untie it. Alexander the Great cut it with his sword, and to 'cut the Gordian knot' became a proverb.

Gordon (gor'don), FAMILY OF, a celebrated Scottish historical house, the origin of which is still wrapped up in a certain measure of obscurity. It is probable that the family came over to England with William the Conqueror, and at a subsequent period settled in Berwickshire, where a parish and village bear this name. The adhesion of Sir Adam Gordon, Justiciar of Lothian, to the cause of Bruce gave him estates on Deeside and the Spey Valley. The direct male line died out in the person of Sir Adam of Gordon, who fell in the battle of Homildon (1402). But, from his female and illegitimate descendants, a number of branches sprang up. His grandson was made Earl of Huntly (1445). The head of this branch was made marquis in 1599, and Duke of Gordon in 1684. It became extinct in 1836. The title Marquis of Huntly passed to a branch of the family which acquired the title of Earl of Aboyne in 1660. The earls of Sutherland, the barons of Lochinvar, the viscounts of Kenmure, and the earls of Aberdeen are all branches of the Gordon family. The title Duke of Gordon was revived in 1875, and given to the Duke of Richmond and Lennox.

Gordon, CHARLES GEORGE, a British soldier, known also as 'Chinese Gordon' and Gordon Pasha, was born at Woolwich in 1833, killed at Khartoum in 1885. He entered the Royal

Engineers in 1852, and served in the Crimea (1854-56). During the Taeping rebellion in China Gordon succeeded in completely crushing the revolt by means of a specially-trained corps of Chinese, exhibiting marvelous feats of skillful soldiership. On his return to England with the rank of colonel he was appointed chief engineer officer at Gravesend, where his military talents and philanthropy were conspicuously displayed. From 1874 to 1879 he was governor of the Soudan under the khedive. For a few months in 1882 he held an appointment at the Cape, and he had just accepted a mission to the Congo from the king of the Belgians, when he was sent to withdraw the garrisons detained in the Soudan by the insurgent mahdi. He was shut up in Khartoum by the rebels, and gallantly held that town for a whole year. A British expeditionary force under Lord Wolseley was despatched for his relief, but found great difficulty in the desert journey, and an advance corps sighted Khartoum on 24th January, 1885, only to find that the town had been captured by the mahdi two days before, and Gordon murdered. Gordon's character was marked by strong religious feelings, which in time became so intensified as to make him somewhat of a religious enthusiast and fatalist.

Gordon, Charles William ("Ralph Connor"), a Canadian clergyman and author, born in Glengarry, Ontario, September 13, 1860; studied at Toronto University and Knox College, Toronto, and was a Presbyterian missionary in the Rocky Mountains from 1890 to 1894, when he became minister of St. Stephen's, Winnipeg. His best known novels are *Black Rock* (1898), *The Sky Pilot* (1899), *The Man from Glengarry* (1901), *The Prospector* (1904), *The Doctor* (1906).

Gordon Bennett, a mountain, 15,000 feet, in Central Africa, in the Ruwenzon range, near the Albert Nyanza, first seen by Stanley in 1875.

Gordon, Lord George, son of Cosmo George, Duke of Gordon, born 1751; died in 1793. He entered when young into the navy, but left the service during the American war. He then became a member of the House of Commons. His parliamentary conduct was marked by a certain degree of eccentricity, and by his opposition to the ministry. A bill having been introduced into the house for the relief of Roman Catholics from certain penalties and disabilities, in June, 1778, Lord George headed an excited mob of about 100,000 persons, who went in procession to the House of Commons to present a petition against the measure. The dreadful riots which ensued led to his arrest and trial on the charge of high treason; but, no evidence being adduced of treasonable design, he was acquitted. In the beginning of 1788, having been twice convicted of libeling the French ambassador, the Queen of France, and the criminal justice of his country, he retired to Holland, but he was arrested, sent home, and committed to Newgate, where he passed the remainder of his life. He was undoubtedly of unsound mentality.

Gordon, John Brown, soldier, was born in Upson County, Georgia, in 1832; died in 1904. He became an infantry captain in the Confederate Army in 1861, served through the war with great distinction, being wounded eight times, and becoming major-general. He was elected to the United States Senate in 1873; resigned in 1880, and in 1886 he was elected Governor of Georgia. He served as senator again, 1891–97. He was chosen commander-in-chief of the United Confederate Veterans in 1900.

Gordon, Sir John Watson, a Scottish painter, and president of the Royal Scottish Academy, was born in Edinburgh in 1788; died in 1864. He applied himself almost exclusively to portrait-painting, in which he obtained great excellence. He was employed to paint the portraits of many of the most eminent men of the day, among whom we may mention Sir Walter Scott, Dr. Chalmers, De Quincey, etc.

Gordon, Patrick, a Scottish soldier, born 1635; died at Moscow in 1699. In 1661 he entered the Russian service, became a general, and rose high in favor with Peter the Great. He kept an interesting diary for the last forty years of his life, part of which has been published.

Gore, Thomas Pryor, statesman, born in Webster County, Mississippi, in 1870, lost the sight of his left eye at 8 and of the right eye at 11, by accidents, yet was graduated in a normal school in 1890, taught school 1890–91, was graduated in law at Cumberland University (Tenn.) and was admitted to the bar in 1892. He removed to Texas in 1895, was nominated for Congress by the People's Party in 1898, but defeated. He joined the Democratic party in 1899, removed to Lawton, Oklahoma, in 1901; was elected to the Territorial Legislature in 1902–05, and after an active canvass, in which he had blindness and poverty to contend with, he was elected United States Senator for a partial term in 1907, and re-elected in 1909.

Goree (gor-ē), a small island, or rather rock, belonging to France, on the coast of Africa, a little more than a mile from the southern shore of the promontory that forms Cape Verde. Pop. 2000.

Gorgas (gor'gas), William Crawford (1854-1920), an American sanitarian, surgeon-general of the United States Army, born at Mobile, Ala., graduated from the University of the South in 1875. In 1880 he became a surgeon in the army, and in 1898 was appointed chief sanitary officer in Havana, where he stamped out yellow fever. He was chief sanitary officer of the Panama Canal 1904-13; became major-general and surgeon-general of the U. S. Army in 1914. He died in London, England, July 4, 1920, while preparing to undertake work for the British government in Africa.

Gorget (gor'jet; French, *gorge*, throat), a piece of body armor, either scale work or plate, for the protection of the throat. The *camail*, or throat covering of chain mail, which is sometimes called the gorget of mail, belonged more to the helmet than to the body armor.

Plate Gorget.

Gorgias (gor'-ji-as), a Greek orator and sophist, born at Leontini in Sicily about 480 B.C. When about sixty years of age he was sent as ambassador to Athens. He was a popular teacher of rhetoric, and Plato named one of his dialogues after him. He is said to have reached the extraordinary age of 107 or 108 years. Two works attributed to him are extant *The Apology of Palamedes* and the *Encomium on Helena*, but their genuineness has been questioned.

Gorgons (gor'guns), in Greek mythology, three frightful goddesses whose names were Stheno, Euryäle, and Medusa. They were all immortal except Medusa. Their hair was said to be entwined with serpents, and they turned to stone all those who looked upon them. Medusa was killed by Perseus (which see).

Gorilla (go-ril'la), *Troglodytes Gorilla*, the largest animal of the ape kind. It attains a height of about 5½ feet, is found chiefly in the woody equatorial regions of the African continent, is possessed of great strength, has a barking voice, lives mostly in trees, and feeds chiefly on vegetable substances, as the fruit and cabbage of the palm-tree, the pawpaw, the banana, etc. The erect position is more readily assumed than in most other anthropoid apes, owing to the shape of the sole of the foot, which is not inverted, and is shorter and broader; but the ordinary gait is on all-fours. It has a ferocious and brutal cast of features, due to extremely prominent supra-orbital ridges and retreating forehead. Its great strength and ferocity make it the monarch of the forests it inhabits, even the lion shrinking from contests with it. Gorillas make a sleeping-place like a hammock, connecting the branches of the

Gorilla

sheltered and thickly-leaved part of a tree by means of the long, tough, slender stems of parasitic plants, and lining it with the broad, dried fronds of palms or with long grass. This hammock-like abode is constructed at different heights from 10 to 40 feet from the ground, but there is never more than one such nest in a tree. The gorilla has thirteen ribs, and in the proportion of its molar teeth to the incisors and in the form of its pelvis it approaches closely the human form. The Phœnician navigator Hanno found the name in use in the fifth century B. C. in W. Africa.

Göritz (gō'ritz). See *Görz*.

Gorkum (gor'kum; properly *Gorinchem*), a fortified town of the Netherlands, on the Linge, at its junction with the Merwede, the name given for a short distance to the river formed by the union of the Waal and the

Maas, 22 miles E. S. E. of Rotterdam. Pop. 11,855.

Gorky, Maxim (ALEXEI MAXIMOVITCH PYESHKOFF), the pen name of a Russian novelist, born in 1868, of a peasant family, spent his early life in tramping and working among the lowest grades of Russian life. He finally began writing, producing stories, novels, and plays which depicted with startling vividness life in the slums and among the tramps of Russia.

Görlitz (geur'lits), a town in the Prussian government of Liegnitz, province of Silesia, on the left bank of the Neisse. It is well built, having generally substantial houses, several large squares and spacious streets. Its industries include woolens, linens, and cottons, machinery, etc. Pop. 80,931.

Görres (geur'res), JAKOB JOSEPH VON, a distinguished German publicist and author, born at Coblentz in 1776; died at Munich in 1848. He began life with very advanced ideas, but ultimately his republican views became much modified, and he ended as an uncompromising Ultramontane R. Catholic. He taught in a school at Coblentz, and having studied Persian, he produced a translation of part of the *Shahnameh*. In 1814 he started the *Rheinische Merkur*, the organ of the German national movement against Napoleon, but it was suppressed in 1816. Owing to his support of Catholicism, he was appointed professor of history at Munich. He wrote on a great variety of subjects. Among the chief works are *Aphorisms on Art, Faith and Science, Mythological History of Asia, Christian Mysticism*, etc.

Gortschakoff (gor'chà-kov), PRINCE MICHAEL, a Russian general, born in 1792; died 1861. He took part as an artillery officer in the battle of Borodino in 1812, and served in the subsequent campaigns of the allies against the French. He took a prominent part in the Turkish war (1828-29); the Polish war (1831); the invasion of Hungary (1849); and in the war with Turkey and the western powers (1853-55). In the Crimea he held the command in Sebastopol during the siege. After the war he was made governor of Poland.

Gortschakoff, ALEXANDER MICHAELOWITCH, Russian diplomatist, brother of the preceding, was born in 1798; died in 1883. He entered the diplomatic service in 1824 as secretary to the Russian embassy in London. His experience in diplomatics was extended in Vienna, Florence, Stuttgart, etc., and he showed considerable dexterity in securing the neutrality of Austria during the Crimean war. In 1856 he became minister of foreign affairs, and in 1862 chancellor of the empire. He was a prominent member of the Berlin Congress, 1878.

Goruckpore (go-ruk'pōr). See *Gorakhpur*.

Gory Dew, a name commonly given to one of the simplest forms of vegetation (*Palmella cruenta*), consisting only of a number of minute cells, which appear on the damp parts of some hard surfaces in the form of a reddish slime. It is an alga nearly allied to the plant to which the phenomenon of red snow is due.

Gorz, GORITZ (geurts, geu'rits), a town of Italy, formerly belonging to Austria, near the head of the Adriatic, 35 miles N. N. W. of Trieste. It consists of the high town on a mountain slope and the new town on the left bank of the Isonzo River. It formed part of Italia Irredenta (see *Irredentism*), and was an objective of the Italian offensive begun in early August, 1916, during the European war. It was captured from the Austrians and held by the Italians till October, 1917, when it was again taken by Austria. On the break-up of the Austro-Hungarian empire it was ceded to Italy with adjoining territory by the treaty of St. Germain, 1919. It has manufactures of silk, cotton, leather, pottery, soap, candles, etc. Pop. 32,000.

Goschen (gō'shen), GEORGE JOACHIM, politician and financier, of German extraction, born in London in 1831; died in 1904. He became a member of Parliament in 1863 and of the Russell cabinet in 1865, and was made chancellor of the exchequer in Lord Salisbury's cabinet. He was the author of a well-known work on the *Theory of Foreign Exchanges*.

Goshawk (gos'hąk), a raptorial bird of the hawk kind, belonging to the genus *Astur* (*A. palumbarius*), and formerly much used in falconry. This bird flies low, and pursues its prey in a line after it, or in the manner called 'raking' by falconers. The female was generally flown by falconers at rabbits, hares, etc., and the larger-winged game, while the male was usually flown at the smaller birds, and principally at partridges.

Goshen (gō'shen), in ancient geography, a district of Egypt which Joseph procured for his brethren.

Goshen, a city, county seat of Elkhart County, Indiana, 110 miles E. of Chicago. Its products include furniture, rubber goods, underwear, bags, veneers, hardwood lumber, condensed milk, ladders, gas engines, etc. Pop. 9525.

Goslar ('gos'lar), an interesting old town of Prussia in Hanover, 26 miles southeast of Hildesheim, on the north side of the Harz, at the foot of the Rammelsberg. It once ranked as a free imperial city, has remains of its old fortifications, and some old buildings, including part of a palace of the German emperors, dating from the eleventh century. There is also a town-house of the fifteenth century. The inhabitants are chiefly engaged in the copper, silver, and other mines in the neighborhood. Pop. 17,817.

Gospel (gos'pel). The Greek word for which *gospel* has been used as the equivalent is *evangelion*, or rather *euaggelion*, a good or joyful message. In the New Testament it denotes primarily the glad tidings respecting the Messiah and his kingdom—this was emphatically the *gospel* (Anglo-Saxon, *gôdspell*, good tidings). It was quite naturally employed as a common title for the historical accounts which record the facts that constitute the basis of Christianity. It may be fairly said that the genuineness of the four narratives written by Matthew, Mark, Luke, and John rests upon good evidence. They were all composed in the latter half of the first century; those of Matthew and Mark some years before the destruction of Jerusalem; that of Luke about the year 64; and that of St. John about the close of the century. Before the end of the second century we have abundant evidence that the four Gospels, as one collection, were generally used and accepted. While the early existence of these Gospels has been admitted, much discussion has taken place regarding their origin, and their relation one to another. They seem to have been viewed as so many original and independent sources, each one as much so as the others. The critical spirit of modern times has refused to halt at this point; it has sought to get at, so to speak, the genealogy of the several Gospels with their different degrees of relationship. Each of the four Gospels has in turn been assumed by different critics to be the first out of which the others arose; and the theory has been more than once propounded of some prior, more strictly original document, no longer extant, which formed the common basis of them all. The supposition of an original document from which the three synoptical Gospels (those of Matthew, Mark, and Luke) were drawn, each with more or less modification, would naturally occur to those who rejected the notion that the evangelists copied from each other. The fourth Gospel, as the narrative coincides with that of the other three in a few passages only, is not drawn into the discussion, and the received explanation is the only satisfactory one with respect to it, namely, that John, writing last, had seen the other Gospels, and purposely abstained from writing anew what had been sufficiently recorded. Another conjecture is that the Gospels sprang out of a common oral tradition. According to this view of the origin of the Gospels, that of Mark, if not the oldest in composition, is yet probably the most direct and primitive in form; it is the testimony delivered by Peter, possibly with little alteration. The Gospels of Matthew and Luke, again, 'represent the two great types of recension to which it may be supposed that the simple narrative was subjected. Luke represents the Hellenic, and Matthew the later Hebraic form of the tradition, and in its present shape the latter seems to give the last authentic record of the primitive Gospel.' A comparison of the three synoptical Gospels yields some interesting results. If we suppose the history they contain to be divided into sections, in forty-two of these all the three narratives coincide; twelve more are given by Matthew and Mark only, five by Mark and Luke only, and fourteen by Matthew and Luke. To these must be added five peculiar to Matthew, two to Mark, and nine to Luke. But this applies only to general coincidence as to the facts narrated; the number of passages either verbally the same, or coinciding in the use of many of the same words, is much smaller. Briefly stated the critical result is as follows:—There is a singular coincidence in substance in the three synoptical Gospels. This agreement would be of no difficulty without the differences; it would only mark the one divine source from which they were all derived. On the other hand, the difference of form and style, without the agreement, would offer no difficulty, since there may be a substantial harmony between accounts that differ greatly in mode of expression, and the very difference might be a guarantee of independence. Several biographies of Jesus and the holy family written by unknown authors of the second, third, and later centuries are known as *Apocryphal Gospels*. They have no historical nor doctrinal value whatever. The titles of the best known of these are: *The Gospel of James*, *The Gospel of Joseph the Carpenter*, *The Gospel of Thomas*, *The Gospel of Nicodemus*, *The Acts of Pilate*, and his *Letter to Tiberias*, etc.

Gosport (gos'pōrt), a town and fortified seaport of England, county of Hants, on the west side of the

entrance to Portsmouth harbor, and directly opposite the town of Portsmouth. Besides containing infantry barracks, it is an important naval depôt, including a victualing yard, large government factories, and Haslar Hospital, the chief establishment in Britain for invalided sailors. Pop. (1911) 33,301.

Gossamer (gos'a-mér) is the name of a fine filmy substance, like cobweb, which is seen to float in the air in clear days in autumn, and is most observable in stubble-fields, and upon furze and other low bushes. This is formed by several kinds of small spiders, and only, according to some, when they are young.

Gosse (gos), EDMUND WILLIAM, son of Philip Henry Gosse, was born in London in 1849. He was appointed assistant in the British Museum in 1867, translator to the Board of Trade in 1875; specially studied the northern literatures, and published *Northern Studies*, consisting of critical essays on Scandinavian, Dutch, and German literature. He also published several volumes of poetry and critical essays, and was Clark Lecturer in English literature at Trinity College, Cambridge, in 1884-89.

Gosse, PHILIP HENRY, naturalist, was born to Worcester, England, in 1810; died in 1888. From 1827 to 1835 he was resident in Newfoundland, and afterwards traveled through Canada and the United States, making all the time large collections of insects, etc. In 1844 he visited Jamaica. Among his many works are: *The Canadian Naturalist, The Birds of Jamaica, A Naturalist's Sojourn in Jamaica, The Aquarium, Marine Zoology, Life, Actinologia Britannica, Romance of Natural History,* etc., besides many contributions to the learned societies.

Göteborg, or GÖTHEBORG (*yeu'te-*borg). See *Gottenburg.*

Gotha (gō'tà), a town of Germany, capital of the Duchy of Saxe-Coburg-Gotha, on the Leine, 14 miles w. s. w. Erfurt, is well built, with fine environs and suburbs. The principal building is the ducal castle or palace, occupying the crown of the height on which the town is situated. This town alternates with Coburg as a residence of the dukes of the duchy. It contains a museum, a picture-gallery, a valuable cabinet of engravings, a library of 200,000 vols. and 6000 MSS., of which 2500 are Arabic and 400 Persian and Turkish; and a collection of over 80,000 coins and medals. The manufactures consist chiefly of woolen, linen, and cotton tissues, porcelain, musical instruments, and various articles in gold and silver. Pop. (1910) 39,553.

Gotha (gō'ta), ALMANACH DE. See the article *Almanac.*

Gotham (gō'tham), a parish and village in the county of and 7 miles s. w. of Nottingham, England. It has an old reputation for folly, but the stories told of the 'wise men of Gotham' are widespread. Washington Irving applied the name to New York.

Gothard (goth'ärd), ST., a mountain group of Switzerland, on the confines of the cantons Tessin and Uri, belonging to the Lepontine or Helvetian Alps, which it connects with the Bernese Alps. It forms a kind of central nucleus in the great watershed of Europe. Its culminating point has a height of 10,600 feet. The Col of St. Gothard, at its summit level, where the Hospice stands, is 6808 feet high. Over it an excellent carriage road was completed in 1832. A railway tunnel has been pierced through this mountain group between Göschenen on the north and Airolo on the south, thus directly connecting the railway system of North Italy with those of Switzerland and Western and Central Germany. This tunnel has a total length of 16,295 yards, or rather more than 9¼ miles. Its construction, begun in 1872, was completed in 1881, and it was opened for traffic early in 1882. Its total cost was about $12,000,000.

Gothenburg System. See *Gottenburg.*

Gothic Architecture (goth'ik), a term applied to the various styles of pointed architecture prevalent in Western Europe from the middle of the twelfth century to the revival of classic architecture in the sixteenth. The term was originally applied in a depreciatory sense to all the styles which were introduced by the barbarians who overthrew the Roman Empire. But the invention or introduction of the pointed arch gave birth to a new style of architecture, to which the name Gothic is now properly restricted. The chief characteristics of Gothic architecture are:—The predominance of the pointed arch and the subserviency and subordination of all the other parts to this chief feature; the tendency through the whole composition to the predominance and prolongation of vertical lines; the absence of the column and entablature of classic architecture, of square edges and rectangular surfaces, and the substitution of clustered shafts, contrasted surfaces, and members multiplied in rich variety. This style originated in France and spread very rapidly to England, Germany,

Italy, Spain, and the Scandinavian countries. In England it was introduced by William of Sens, who built Canterbury Cathedral in 1174, and there followed an independent course of development. The Gothic architecture of Britain has been divided into four principal epochs—the Early English, or general style of the thirteenth century; the Decorated, or style of the fourteenth century; the Perpendicular, practiced during the fifteenth and early part of the sixteenth century (Flamboyant being the contemporary style in France); and the Tudor, or general style of the sixteenth century. From that time Gothic architecture declined in Britain, but a revival set in about 1825, and many fine specimens of Gothic have since been erected, chiefly ecclesiastical buildings.

Gothic Architecture.

a, b, Early English Windows. *c*, Transition. *d*, Geometrical. *e*, Perfect Decorated. *f, g*, Perpendicular.

Gothland (got'land), or GOTTLAND (Swedish, *Götaland*), one of the large sections into which Sweden was originally divided, and including the portion south of lat. 59° 20′ N.

Gothic Architecture.—Salisbury Cathedral.

Goths, an ancient Teutonic tribe occupying when first known to history the region adjacent to the Black Sea north of the lower Danube. A people of similar name is mentioned by Tacitus as dwelling south of the Baltic, and *Geats* or *Gauts* are known to us from the Anglo-Saxon poem *Beowulf* as inhabitants of Southern Sweden; but there is no necessary connection between these and the Goths proper. About the middle of the third century these began to encroach on the Roman Empire. Having seized the Roman province of Dacia, they were assailed by Decius, whom they twice defeated. In 253 they captured Trebizond, where a large fleet of ships fell into their hands. With this force they sailed down the Ægean and plundered the coasts of Greece and Illyria. They now began to threaten Italy, but in 269 they were defeated with great slaughter by the Emperor Claudius. His successor, Aurelian, was, notwithstanding compelled to cede to them the large province of Dacia, after which there was comparative peace between them for many years. In the fourth century the great Gothic kingdom extended from the Don to the Theiss, and from the Black Sea to the Vistula and the Baltic. About the year 369 internal commotions produced the division of the Gothic kingdom into the kingdom of the Ostrogoths (eastern Goths) and the kingdom of the Visigoths (western Goths). In 396 Alaric, king of the Visigoths, made an irruption into Greece, laid waste the Peloponnesus, and became prefect of Illyria. He invaded Italy and sacked Rome in 409, and a second time in 410. After his death (in 410) the Visigoths succeeded in establishing a new kingdom in the southern parts of Gaul

and Spain, of which, towards the end of the fifth century, Provence, Languedoc, and Catalonia were the principal provinces, and Toulouse the seat of government. The last king, Roderick, died in 711 in battle against the Moors, who had crossed from Africa, and subsequently conquered the Gothic kingdom. After the fall of the Western Roman Empire, by the invasion of Odoacer in 476, the Eastern emperor, Zeno, persuaded Theodoric, king of the Ostrogoths, to invade Italy in 489. The Goth became king of Italy in 493, and laid the foundation of a new Ostrogothic kingdom, which, together with Italy, comprised Rhætia (a part of Switzerland and the Tyrol), Vindelicia (part of Bavaria and Swabia), Noricum (Saltzburg, Stiria, Carinthia, Austria), Dalmatia, Pannonia (Further Hungary, Slavonia), and Dacia beyond the Danube (Transylvania, Wallachia). This kingdom came to an end in 554. Subsequently the Goths both here and in Spain entirely disappeared as a distinct people.

Christianity appears to have early taken root among the Goths settled in Moesia, a Gothic bishop being mentioned as present at the council of Nicæa (325). Their form of Christianity was Arianism, which was patronized by their protector Valens, and certainly adopted by their bishop, Ulfilas. The introduction of Christianity among the Goths, and the circumstance of their dwelling near and even among civilized subjects of the Roman Empire, greatly contributed to raising them in civilization above the other German tribes. Bishop Ulfilas, in the fourth century, translated, if not the whole, at least the greater part of the Bible into Moeso-Gothic, using an alphabet which he formed out of those of the Greeks and Romans. Unfortunately only a small portion of this translation has come down to us; but this is quite sufficient to enable us to form an opinion of the language at that time, and is of the highest value from a philological point of view. Besides this translation there exist a few other monuments of the language, which are, however, of minor importance. Gothic was one of the Teutonic tongues, being accordingly a sister of Anglo-Saxon and English, German, Dutch, Danish, etc. Being committed to writing earlier than any other Teutonic language, Gothic exhibits peculiarities entirely its own, and hence its value in the study of Teutonic philology in general. It is richer in inflections than any other of the Teutonic tongues. Swedish is the least like the Gothic of all the Germanic dialects, and the probability is that the Goths migrated to Scandinavia from the country on the east of the Vistula long before they proceeded southward. See *Ulfilas*.

Gottenburg, or GOTHENBURG (got'-en-burg; Swedish, *Göteborg*), a seaport town in Sweden, the second in respect of population and trade, capital of the län of the same name, situated at the mouth of the Göta, in the Kattegat, 255 miles W. S. W. Stockholm, intersected by canals. It is one of the best built towns in Sweden, and the seat of a bishopric. It has manufactures of sail-cloth, cotton, and other goods, and possesses shipbuilding yards, tobacco factories, breweries, sugar refineries, etc. The trade is very extensive, the harbor being excellent and always free from ice. It has a good depth of water, is defended by forts, and there is a drydock cut in

the solid rock. The completion of the Göta canal and railway facilities have increased its importance. Among social reformers the town is noted for its licensing system, known as the 'Gottenburg system,' under which the public-house licenses are controlled by the municipality and granted to a company, which, after paying the expenses of management with 6 per cent. annual interest on the shareholders' capital, makes over the profits to the town treasury. This plan has been in force since 1865, and has been experimented with, less successfully, in some other localities. Pop. 177,200.

Gottfried (got'frēd) VON STRASBURG. See *Godfrey of Strasburg*.

Göttingen (geut'ing-en), a town of Prussia, province of Han-

over, on the Leine, 50 miles S. S. E. Hanover. It is a place of great antiquity, and is generally well built, having wide and spacious streets. Its chief attraction is the university, founded in 1734 by George II of England and elector of Hanover, opened in 1737, and which has a European reputation. It has an average attendance of over 1000 students. Connected with the university are a museum, an observatory, an anatomical theater, botanical garden, and a library possessed of 500,000 printed volumes and 5000 MSS. The manufactures comprise woolens, chemicals, scientific instruments, etc. Pop. (1910) 37,594.

Gottland, or GOTHLAND (got'land), an island of the Baltic, belonging to and 55 miles east of the coast of Sweden. It is of irregular shape, and has an area of 1200 sq. miles. The coast is for the most part rocky and deeply indented. The interior consists of a limestone plateau, intersected near its center by a range of heights from 200 to 300 feet above the sea. The soil is fertile. The chief town, Wisby, was once a flourishing member of the Hanseatic League. Pop. 52,781.

Gottsched (got'shet), JOHANN CHRISTOPH, a German writer, born in 1700; died in 1766. He became professor of eloquence and poetry, and afterwards of logic and metaphysics at Leipzig; and for many years was dictator in Germany in matters of literary taste. In 1728 he published the first sketch of his *Rhetoric*, and in 1729 his *Kritische Dichtkunst* ('Critical Art of Poetry'). Both these works condemn the disfigurement of the language by the use of foreign words, and oppose the bombast in poetry then prevailing.

Gottschalk (got'shâlk), LOUIS MOREAU, musician, was born in New Orleans, Louisiana, in 1829. His marked musical ability induced his father to send him to Paris to receive further education. In 1848 his series of public concerts in Paris met with much success. He afterwards appeared in the United States and in Mexico and South America. He died in Brazil in 1869.

Gouda (gou'dà), a town of Holland, in the province of South Holland, 11 miles northeast of Rotterdam, separated into two unequal parts by the Gouwe, which here unites with the Ijssel. The town is composed of neatly built houses, and is intersected by numerous canals. The great marketplace is the largest in Holland. The church of St. John is noted for its organ and its painted glass windows, said to be among the finest in Europe. There are pipe-works, potteries, and breweries, and manufactories of stearine candles, yarn, and cigars. Gouda is a great market for cheese, sold under the name of Gouda cheese. Pop. 22,303.

Goudimel (gö-di-mel), CLAUDE, a French musical composer, born in 1510; killed during the St. Bartholomew massacres at Lyons in 1572. Palestrina was one of his pupils at Rome. His most important work is a setting of the French version of the Psalms by Marot and Beza. Some of these tunes are still used by the French Protestant Church and by the German Lutherans.

Gough (gof), HUGH, VISCOUNT, an English general; born at Woodstown, County Limerick, in 1779; died 1869. He joined the army in 1794, and was present the year after at the capture of the Cape of Good Hope. He served in Spain in 1809-13; was made major-general in 1830, and sent to India as commander of the Mysore division of the army in 1837. He commanded the land forces in the Chinese war of 1841; was made baronet, and returned to India as commander-in-chief; suppressed the revolt of the Mahrattas, 1843; and commanded in the Sikh wars of 1845-48. He was superseded by Sir Charles Napier in 1849. He was made baron in 1846; created viscount and pensioned, 1849; field-marshal, 1862.

Gough, JOHN BARTHOLOMEW, temperance orator, born at Sandhurst, Kent, in 1817; died in 1886. He attained a great celebrity as a fervid orator on his special subject in the United States and elsewhere, and published his autobiography, orations, and a volume of sketches, *Sunlight and Shadow*.

Goulburn (göl'bêrn), a city of New South Wales, in Argyle County, 134 miles S. W. of Sydney, well laid out with broad streets lined with substantial buildings. Pop. 10,916.

Gould (göld), AUGUSTUS ADDISON, naturalist, born at New Ipswich, New Hampshire, in 1805; died in 1866. He graduated in medicine at Harvard College in 1830, and while practicing engaged in scientific study, devoting himself to botany, zoology and conchology. In the latter he became an authority of world-wide eminence. He aided Sir Charles Lyell in his geological investigations in the United States. He was the author of valuable works on conchology and other subjects.

Gould, BENJAMIN APTHORP, astronomer, born at Boston, Massachusetts, in 1824; died in 1896. Graduating at Harvard in 1844, he pursued the study of science abroad, and in 1849 was ap-

pointed on the United States Coast Survey, when he devised methods to determine longitude by aid of the telegraph. He was director of the national observatory at Cordova, Argentina, 1870-85, completing there three extensive catalogues of stars, and conducting observations in meteorology and climatology. His *Uranometry of the Southern Heavens* is a work of great value.

Gould, Helen Miller, philanthropist, daughter of Jay Gould, was born in New York in 1868. Inheriting ample means from her father, she became distinguished for her discriminative gifts for charitable and educational purposes. During the war with Spain she became an active worker in the Woman's National War Relief Association, and contributed liberally to its funds, and for other purposes connected with the war. Since then she has given much for educational purposes, including $100,000 to the University of N. Y. She married Finley J. Shepard, January 22, 1913.

Gould, Jay (Jason), financier, was born in Roxbury, Delaware County, New York, in 1836; died in 1892. He was one of the first of the daring American speculators and one of the most unscrupulous of them all. By his unusual ability as a stock-dealing financier and his audacious schemes and methods, he accumulated an enormous fortune for his era, valued at over $72,000,000.

Gould (gōld), John, ornithologist, born at Lyme, Dorsetshire, in 1804; died at London in 1881. Originally a gardener, he was appointed curator to the Zoological Society's Museum in 1827, and henceforward his whole life was devoted to the study of birds. His chief works—all magnificently illustrated—are: *A Century of Birds from the Himalayan Mountains*, 1831; *The Birds of Europe*, 5 vols. folio, 1832-37; *The Birds of Australia*, 7 vols. folio, 1840-48, with 3 supplementary volumes, 1850-52; *The Birds of Great Britain*, 5 vols., 1862-73, etc., besides a number of monographs on the humming-birds, the trogons, etc.

Gounod (gö-nō), Charles François, a French operatic composer, born at Paris in 1817; studied at the Conservatoire under Halévy, Lesueur, and Pauer, and afterwards in Italy. His first important work was *Faust* (1859), which raised him to a high rank among composers. Other operas followed—*Mireille* (1864), *Romet et Juliette*, *Cinq Mars* (1877), *Polyeucte* (1878), and later, *Charlotte Corday*. He wrote also a *Messe Solennelle*, a motet *Gallia*, and other choral works and songs: his oratorios *Redemption* (1882) and *Mors et Vita* (1885), and a Mass for the Jeanne D'Arc festival (1887), were popular. He died in 1893.

Goura (gō'ra), a genus of large-sized pigeons, natives of the Papuan Archipelago, comprising about six species known as crowned pigeons, and remarkable for their great size and the open erect crest with which the head is adorned. They pass most of the time on the ground, feed on fruits, and build their nests on the lower branches of trees. They have a stately bearing, harmoniously-colored plumage, and are in high esteem for the table.

Gourami. See *Goramy*.

Gourd (görd), the popular name for the species of *Cucurbita*, a genus of plants of the nat. order Cucurbitaceæ. The same name is given to the different kinds of fruit produced by the various plants of this genus. These are held in high estimation in hot countries; they attain a very large size, and most of them abound in wholesome, nutritious matter. The *C. Pepo*, or pumpkin, acquires sometimes a diameter of 2 feet.

Flower and Fruit of Squash (*Cucurbita Melopepo*).

The *C. Melopepo*, or squash, is cultivated in America as an article of food. The *C. Citrullus*, or watermelon, serves the Egyptians for meat, drink, and physic, and is largely grown in the United States. The *C. aurantia*, or orange-fruited gourd, is cultivated only as a curiosity, and is a native of the East Indies. The *Lagenaria vulgāris*, or bottle gourd, a native both of the East and West Indies, is edible, and is often 6 feet long and 18 inches in circumference. The outer coat or rind serves for bottles and water-cups.

Gourd-tree. Same as *Calabash-tree*.

Gourock (gö'rok), a town of Renfrewshire, Scotland, on the Firth of Clyde, 2 miles west of Greenock. It is a favorite watering-place, yachting station, and has a pier for steamers. Pop. 5261.

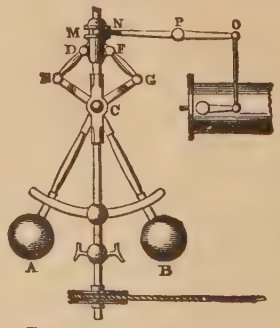
Gout, a form of arthritis, a constitutional disorder giving rise to paroxysms of acute pain with a specific form of inflammation, appearing after puberty, chiefly in the male sex, and returning after intervals. It is very often preceded by, or alternates with, disorder of the digestive or other internal organs, and is generally characterized by affection of the first joint of the great toe, by nocturnal exacerbations and morning remissions, and by vascular plethora; various joints, organs, or parts becoming affected after repeated attacks without passing into suppuration. It may be acquired or hereditary. In the former case it rarely appears before the age of thirty-five; in the latter, it is frequently observed earlier. Gout was formerly believed to be due to an excess of uric acid, but recent researches point to an infective origin, the source of the toxæmia being the digestive tract. Indolence, inactivity, and too free use of tartarous wines, fermented liquors and very high-seasoned and nitrogenous food are the principal causes which give rise to this disease. Gout is also called, according to the part it may affect, *Podagra* (in the feet), *Gonagra* (in the knees), *Chiragra* (in the hands), etc. It may be acute or chronic, and may give rise to concretions, which are chiefly composed of urate of soda. It is a disease very difficult to cure, as its regular attacks usually occur late in life, when the habits of indulgence which are adverse to its cure have become fixed. Strict regulation of the habits of life is one of the most important elements in the treatment of gout.

Gout-weed. See *Bishop-weed.*

Govan (guv'an), a town of Scotland, county of Lanark, on the left bank of the Clyde, to the west of Glasgow, of which it forms a suburb. It is the site of extensive shipbuilding yards, engineering works, dyeworks, etc. Pop. (1911) 89,725.

Government (guv'ern-ment) is a word used in common speech in various significations. It denotes the act of governing, the persons who govern, and the mode or system according to which the sovereign powers of a nation, the legislative, executive, and judicial powers are vested and exercised. Aristotle classified the forms of government into three classes: 1st, Monarchy, or that form in which the sovereignty of the state is vested in one individual; 2d, Aristocracy, or that in which it is confided to a select portion of the community supposed to possess peculiar aptitude for its exercise; and 3d, Democracy, or that in which it is retained by the community itself, and exercised, either directly, as in the small republics of ancient Greece, or indirectly, by means of representative institutions, as in the constitutional states of modern times. Each of these forms if brought into existence by the general will of the community, maintained by its consent, and employed for its benefit, is said to be a legitimate government. But each of these legitimate forms was considered by the ancients to be liable to a particular form of corruption. Monarchy had a tendency to degenerate into tyranny, or a government for the special benefit of the single ruler; aristocracy became oligarchy; and democracy degenerated into ochlocracy or mob rule. Through each of these various forms, each legitimate form being followed by its corresponding perverted form, government was supposed to run in a perpetual cycle; the last form, ochlocracy, being followed by anarchy. As a means of avoiding these evils, a mixed government is supposed to have been devised. The best species of mixed government was believed by Aristotle to be a union of aristocracy and democracy. The most remarkable instance of this form is, however, supposed to be seen in that balance of powers which forms the essence of the British constitution. The most remarkable instance of democratic government is the federal republic of the United States. See *Aristocracy, Democracy, Monarchy, Oligarchy, Republic, etc.*

Governor (guv'ér-nur), a contrivance in mills and machinery for maintaining a uniform velocity with a varying resistance. A common



Governor of a Steam-engine.

form of steam-engine governor consists of a pair of balls (A B) suspended from a vertical shaft kept in motion by the engine. When the engine goes too fast the

balls fly farther asunder, and depress the end of a lever (N P O), which partly shuts a throttle-valve, and diminishes the quantity of steam admitted into the cylinder; and on the other hand, when the engine goes too slow, the balls fall down towards the spindle and elevate the valve, thus increasing the quantity of steam admitted into the cylinder. By this ingenious contrivance, therefore, the quantity of steam admitted to the cylinder is exactly proportioned to the resistance of the engine, and the velocity kept constantly the same. A similar contrivance is employed in mills to equalize the motion of the machinery. When any part of the machinery is suddenly stopped, or suddenly set going, and the moving power remains the same, an alteration in the velocity of the mill will take place, and it will move faster or slower. The governor is used to remedy this.

Governor's Island, an island in New York harbor, on which is Fort Columbus, headquarters of the Military Department of the East; also a small island at the main entrance of Boston Harbor, on which is Fort Winthrop.

Gower (gou'ẽr), JOHN, an early English poet, a contemporary and friend of Chaucer, born about 1320;

John Gower.

died in 1408. He was liberally educated, and was a member of the society of the Inner Temple. He appears to have been in affluent circumstances, as he contributed largely to the building of the conventual church of St. Mary Overy, in Southwark. His chief works are his *Speculum Meditantis*, *Vox Clamantis*, and *Confessio Amantis*, of which the first was a moral tract relative to the conjugal duties, written in French rhymes (now lost); the second a metrical chronicle of the insurrection of the commons under Richard II, in Latin elegiac verse; and the third an English poem in eight books, containing 30,000 lines, relative to the morals and metaphysics of love, one of the earliest products of the English press, being printed by Caxton in 1483.

Gowrie (gou'rē) CONSPIRACY, one of the strangest episodes in Scottish history, took place in August, 1601. King James VI while hunting in Falkland Park, Fifeshire, was asked by Alexander Ruthven (brother of the Earl of Gowrie) to accompany him to Gowrie House, near Perth, on the pretext that they had caught a Jesuit with an urn of foreign golden pieces hid under his cloak. On arriving at Gowrie House an attempt was made on the life or liberty of the king, but an alarm being raised, both the Ruthvens were slain, and James with difficulty escaped, as the Gowries were very popular with the inhabitants of Perth.

Goyanna (gō-yän'a), a city of Brazil, prov. of Pernambuco, 40 miles N. W. of the port of Recife or Pernambuco. Commerce in cotton, sugar, rum, hides, timber, castor-oil, etc. Pop. about 15,000.

Goyaz (gō-yäsh'), an inland province of Brazil, area 288,462 square miles. Chief town, Goyaz. The principal occupation of the inhabitants is cattle rearing and agriculture. Gold was formerly plentiful, and diamonds and other precious stones have been found. Pop. 540,000. The chief town, formerly called Villa Boa, has a cathedral, government palace, etc. Pop. 25,000.

Gozo, or GOZZO (got'sō), an island of the Mediterranean, belonging to Britain, about 4 miles N. W. of Malta; length, 9 miles; breadth, 5 miles; area, about 40 square miles. A good deal of grain and fruit is raised; but the most important crop is cotton. Cattle of superior quality are reared. The chief town, Rabato, contains about 5000, and the whole island about 22,000 inhabitants.

Gozzi (got'sē), CARLO, an Italian dramatist, born at Venice in 1722; died in 1806. His principal work consists of a series of dramas based on fairy tales, which obtained much popularity, and were highly praised by Goethe, Schlegel, De Staël, Sismondi, etc.

Gozzoli (got'so-lē), BENNOZO, an Italian painter, born at Florence in 1424; died some time after 1496. He was a pupil of Fra Angelico, and wrought at Florence, Rome, Orvieto, and Pisa. His name is specially identified with the great series of mural paintings in the Campo Santo, at Pisa, consisting of 24 subjects from the Old Testament,

from the *Invention of Wine by Noah* to the *Visit of the Queen of Sheba to Solomon.*

Graaff-Reinet (gräf-rī'net), a town of Cape Colony, capital of a division of the same name, the oldest and largest town in the midland district of the colony. There are churches and schools of the English Episcopalian and the Dutch Reformed denominations, a public library, and a college. It is regularly laid out with streets at right angles, the intervening squares being filled up with vineyards and gardens. Pop. about 6000.

Graafian-Vesicles (graf'i-an), in anatomy, numerous small, globular, transparent follicles found in the ovaries of mammals. Each follicle contains one ovum, which is expelled when it reaches maturity. Small at first, and deeply embedded in the ovary, they gradually approach the surface, and finally burst and discharge the ovum.

Graal. See *Grail.*

Gracchus (grak'kus), a Roman family of the Sempronian gens, several members of which have become historical. TIBERIUS SEMPRONIUS GRACCHUS, a general of the Second Punic war, was consul 215 B.C., defeated Hanno 214 B.C., and was killed 212 B.C.—Another TIBERIUS SEMPRONIUS GRACCHUS became consul 178 B.C., and again 163 B.C. He married Cornelia, a daughter of Scipio Africanus, and was the father of the two most celebrated Gracchi, TIBERIUS SEMPRONIUS and CAIUS, the former born about 169 B.C., killed 133 B.C.; the latter born 159 B.C., killed 121 B.C. The brothers having lost their father early, received from their mother Cornelia a careful education. At a more advanced age their minds were formed and ennobled by the Greek philosophy. Tiberius early made himself conspicuous in the military service. Under the command of his brother-in-law, the younger Scipio, he served at the siege of Carthage. While he was yet a mere youth he was received into the College of Augurs—an honor usually conferred only upon distinguished statesmen. He was subsequently quæstor to the Consul Mancinus, and was employed in the Numantian war, in which he greatly distinguished himself by the conclusion of a treaty by which he saved the lives of 20,000 men who were entirely at the mercy of the Numantines. This treaty was, however, repudiated by the Romans, but it increased his popularity immensely. In 133 B.C. he offered himself as a candidate for the tribuneship, which office rendered his person inviolable so long as he was invested with it, and placed him in a situation to advance his great plans for the improvement of the condition of the people in a legal way. His first efforts were directed to a reform of the Roman land system, by the restoration or enforcement of the old Licinian law, which enacted that no one should possess more than 500 acres of the public domains, and that the overplus should be equally divided among the plebeians. This law, which was now called, after Gracchus, the *Sempronian*, or, by way of eminence, the *agrarian law*, he revived, but with the introduction of several softening clauses. He was violently opposed by the aristocracy and the tribune Marcus Octavius, whose veto retarded the passage of the bill. Tiberius, however, by exerting all the prerogative of his office, managed to pass his bill, and three commissioners were appointed to carry it into execution, namely, Tiberius himself, his brother Caius, and his father-in-law Appius Claudius. Soon after this Attalus, king of Pergamus, died, bequeathing his treasures to the Roman people. Tiberius proposed that this bequest should be divided among the recipients of land under the new law, and to give the popular assembly instead of the senate the management of the state. But fortune turned against him; he was accused of having violated his office; of aspiring to be king; and at the next election for the tribuneship he was slain, with 300 of his followers, at the entrance to the Temple of Fides. Ten years after the death of his brother Tiberius, the younger Gracchus obtained the tribuneship. In the discharge of his office he first of all renewed his brother's law, and revenged his memory by expelling many of his most violent enemies from the city. Several popular measures gained him great favor with the people, but the intrigues of the nobles ultimately caused his fall. Livius Drusus, a tribune gained over to their interests, had the art to withdraw the affections of the populace from Caius by making greater promises to them, and thus obtained a superior popularity for himself and the senate. Hence it resulted that Caius did not obtain a third tribuneship, and Opimius, one of his bitterest enemies, was chosen to the consulate. A tumult, in which a lictor of Opimius was killed, gave the senate a pretence for empowering the consuls to take strong measures. Opimius made an attack upon the supporters of Gracchus with a band of disciplined soldiers. Nearly 3000 were slain, and Gracchus escaped to the grove of the Furies, where he was slain at his

own request by a slave, who then killed himself.

Grace (grās), in theology, the divine influence or the influence of the Holy Spirit in renewing the heart and restraining from sin; or, that supernatural gift to man whereby he is enabled to take to himself the salvation provided and offered through Christ (special or saving grace). Before the fifth century little attention was paid to the dogmatic question of grace and its effects. Pelagius, a native of Britain, having used some free expressions, which seemed to attribute too little to the assistance of divine grace in the renovation of the heart of man, and too much to his own ability to do good, Augustine undertook an accurate investigation of this doctrine. He came to the opinion, which has since been so much discussed, that God, of his own free-will, has foreordained some to eternal felicity and others to irrevocable and eternal misery. In accordance with this view of Augustine is the doctrine of predestination. The majority of those who were considered Catholic or Orthodox coincided with Augustine, and, with him, pronounced the Pelagians heretics, for holding that human nature is still as pure as it was at its first creation, that all the corruption which prevails is the effect of the influence of bad example, and that, consequently, man being sufficient for his own purification, has no need, at least, of preventing grace. The Abbot Cassianus, of Marseilles, adopted a middle course, in order to reconcile the operations of grace and free-will in man's renovation, by a milder and more scriptural mode. He considered the predestination of God, in respect to man's salvation, as a conditional one, resting upon his own conduct. His followers were named *semi-* or *half-Pelagians*, though the Catholic Church did not immediately declare them heretics. Subsequently a gradual change of sides was exhibited. During the middle ages the scholastic theologians so perverted the doctrines of Augustine as to make them easily reconcilable with those of the Pelagians. But at the Reformation Calvin and Beza, and the great body of their followers, returned to the fundamental principles of Augustine. In the meantime, however, the Catholics had not come to a final agreement concerning this dogma. This appears from the quarrels of the Dominicans and Jesuits, and from the case of the Jesuit Lewis Molina, in 1588, from whom the Molinistic disputes in the Netherlands received their name. In the seventeenth century, also, two new parties, which had their origin in the dispute concerning the doctrine of predestination, sprang up in the Netherlands, namely the Arminians or Remonstrants, among the Protestants, and the Jansenists among the Catholics. (See *Arminians, Jansenists.*) From that time the members of the Christian church have continued to differ upon this subject.

Grace, Days of, in commerce, a certain number of days immediately following the day, specified on the face of a bill or note, on which it becomes due. Till the expiry of these days payment is not necessary. In Britain and the United States the days of grace are three, but they have been rescinded in some of the American States. Austria (three days) and Russia (ten days) are the only other countries which allow days of grace.

Graces (grā'ses; Greek, *Charites*, translated by the Romans *Gratiæ*), the goddesses of grace, from whom, according to Pindar, comes everything beautiful and agreeable. According to most poets and mythologists, they were three in number, the daughters of Zeus and Eurynŏme, and Hesiod gives them the names of *Aglaia* (brilliancy), *Thalia* (the blooming), and *Euphrosÿnē* (mirth). Homer mentions them in the *Iliad* as handmaids of Hera (Juno), but in the *Odyssey* as those of Aphroditē (Venus), who is attended by them in the bath, etc. He conceived them as forming a numerous troop of goddesses, whose office it was to render happy the days of the immortals. The three graces are usually represented slightly draped or entirely nude, locked in each other's embrace, or hand in hand.

Graciosa (grä-sē-ō'za), one of the Azores. Chief town, Santa Cruz. Pop. 9000.

Gradient (grād'yent), in roads and railways, a term used to signify the departure of the track from a perfect level, usually expressed as a fraction of the length: thus 1 in 250 signifies a rise or fall of 1 foot in 250 feet measured along the line.

Gradual (grad'ū-al), the psalm, anthem, or hymn, said or sung in the service of the Roman Catholic Church between the Epistle and the Gospel; so named from being anciently chanted on the steps of the ambo or pulpit, or of the altar. By an easy transition the name was frequently applied to the Antiphonary, which was originally one of the three service books of the church, but afterwards in the eleventh or twelfth century included in the missal.

Graduation (grad-ū-ā'shun), the art of dividing into the

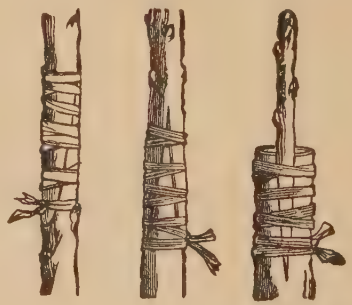
necessary spaces the scales of mathematical, astronomical, and other philosophical instruments. Common graduation is simply effected by copying from a scale prepared by a higher process; original graduation is chiefly performed either by *stepping* or bisection. Stepping consists in ascertaining by repeated trial with finely-pointed spring-dividers—which are made, as it were, to proceed by successive steps—the size of the divisions required, their number being known, and then finally marking them. In bisection the beam compasses are used, an arc with a radius of nearly half the line being described from either end of the line, and the short distance between the arcs bisected with the aid of a magnifier and a fine pointer. The process is repeated, for each of the two halves thus obtained, until by subdivision the required graduation is obtained. Ordinary instruments are graduated by machines, most of which are based upon the principle of that invented by Ramsden in 1766. In this there is a horizontal wheel, turning on a vertical axis, with a toothed edge which is advanced a certain amount (*e. g.* 10′ of arc) by each revolution of the endless screw with which it gears. The screw is worked by a treadle, and the machine can be so adjusted that a movement of the treadle shall secure either the whole or any desired part of a revolution of the screw. A dividing engine was invented by Troughton, but it was exceedingly complicated. That of Simms, which was self-acting and threw itself out of gear when its work was done, takes a high place among mechanical inventions. The most accurate was that of Andrew Ross (1831). For fine graduation Froment invented a machine in which the object to be graduated was slowly and intermittingly pushed forward by a screw, while a fine steel or diamond point, working automatically, made a cut at each cessation of the feeding motion. He thus drew 25,000 lines marking equal intervals in the space of one inch, but the number has since been increased to 225,000 by Nobert See *Nobert's Test Plates.*

Gra'dy, HENRY WOODFEN, editor, born at Athens, Georgia, in 1851. After being correspondent to the Atlanta *Constitution* and Southern correspondent to the New York *Herald,* he became editor and part-owner of the *Constitution.* He was devoted to the development of the 'New South,' and was widely known as the exponent of friendly feelings toward the North. His numerous articles on the condition of the South attracted universal attention. He died in 1889.

Graffiti (graf-fē'tē), the rude designs and inscriptions of popular origin drawn or engraved with a style upon the walls of ancient towns and buildings, particularly of Rome and Pompeii. Those in Pompeii are in Latin, Greek, and Oscan.

Graft, GRAFTER, a recent addition to political slang in the United States, and referring to the practice of secret bribery for political services or of defrauding states or cities for personal aggrandizement. Any dishonest gain in political or official service is called graft, and those taking part in it grafters. A grafter has been defined by Governor Folk, of Missouri, as 'one who fastens himself on the people either with or without the sanction of the law, and draws an unjust profit from the people.' (For analogy see next article.)

Grafting (graft'ing), an operation by which a bud or scion of an individual plant is inserted upon another individual, so as to become organically united with the stock on which it has been placed. Grafting can only take place between plants which have a certain affinity, individuals of the same species, genus, or order. The graft does not become identified with the stock to which it is united, but retains its own peculiarities of variety or species. The



Splice-grafting. Saddle-grafting. Cleft-grafting.

parts between which grafting is effected must be actively vegetating. The advantages derived from grafting are the preservation of remarkable varieties, which could not be reproduced from seed; the more rapid multiplication of particular species, and the anticipation of the period of fructification, which may thus be advanced by several years. The principal methods of grafting are—1. *By approach.*—This process is intended to unite at one or more points two plants growing from separate roots. Plates of

bark of equal size are removed, the wounds are kept together and protected from air. Stems, branches, or roots may be united in this way. 2. *By scions.*— Under this head there are a variety of methods, such as *whip, splice, cleft, saddle, crown grafting,* etc. In *whip-grafting* or *tongue-grafting* the stock is cut obliquely across and a slit or very narrow angular incision is made in its center downwards across the cut surface, a similar deep incision is made in the scion upwards, at a corresponding angle, and, a projecting tongue left, which being inserted in the incision in the stock, they are fastened closely together. *Splice-grafting* is performed by cutting the ends of the scion and stock completely across in an oblique direction, in such a way that the sections are of the same shape, then laying the oblique surfaces together so that the one exactly fits the other, and securing them by tying or otherwise. In *cleft-grafting,* the stock is cleft down, and the graft, cut in the shape of a wedge at its lower end, is inserted into the cleft; while, in *saddle-grafting,* the end of the stock is cut into the form of a wedge, and the base of the scion, slit up or cleft for the purpose, is affixed. *Crown-grafting* or *rind-grafting* is performed by cutting the lower end of the scion in a sloping direction, while the head of the stock is cut over horizontally and a slit is made through the inner bark. A piece of wood, bone, ivory, or other such substance, resembling the thinned end of the scion, is inserted in the top of the slit between the alburnum and inner bark and pushed down in order to raise the bark, so that the thin end of the scion may be introduced without being bruised. The edges of the bark on each side are then brought close to the scion, and the whole is bound with matting and a lump of clay put round it. 3. *By buds.*— This consists in transferring to another stock a plate of bark, to which one or more buds adhere. Bud-grafting is the most commonly practised, especially for multiplying fruit-trees and roses, owing to the facility with which it may be performed.

Grafton (graf'ton), AUGUSTUS HENRY, THIRD DUKE OF, born in 1735. He was secretary of state under Rockingham, first lord of treasury under the elder Pitt, and premier during the illness of the latter (then Lord Chatham). He subsequently held the privy seal under Lord North, and again under Rockingham. He died in 1811. He was the subject of some of the most brilliant of the famous and bitingly satirical letters of Junius.

Grafton (graf'ton), county seat of Taylor County, West Virginia, 99 miles S. E. of Wheeling, in a region of coal and natural gas. It has railroad shops, glass, tile and pottery works, etc.; a state reform school and national cemetery. Pop. (1920) 8517.

Grafton, a town (township) of Worcester Co., Massachusetts, 6 miles S. E. of Worcester. The township is drained by the Blackstone River and its tributaries, which afford water-power. Boots and shoes, cotton and thread are largely manufactured. Pop. (1920) 6887.

Gragnano (grä-nyä'nō), a town of Italy, province of Naples. It is chiefly of interest for its wines and macaroni. Pop. 14,642.

Graham (grām or grā'am), GEORGE, mechanician and watchmaker, born in Cumberland, 1675. He succeeded Topion, the watchmaker, in business in London, and invented several important astronomical instruments. He invented the dead-beat escapement and a compensation pendulum for clocks.

Graham, JAMES. See *Montrose, Marquis of.*

Graham, JOHN, Viscount Dundee, commonly known as Claverhouse, eldest son of Sir William Graham of Claverhouse, was born about 1650, and educated at St. Andrews. He went abroad and entered the service of France and afterwards of Holland, but, failing to obtain the command of a Scottish regiment in the Scottish service, he returned to Scotland in 1677, where he was appointed captain of a troop of horse raised to enforce compliance with the establishment of Episcopacy. He distinguished himself by an unscrupulous zeal in this service, especially after the murder of Archbishop Sharpe in May, 1679. The Covenanters were driven to resistance, and a body of them defeated Claverhouse at Drumclog, on 1st June. On the 22d, however, the Duke of Monmouth defeated the insurgents at Bothwell Brig, and Claverhouse was sent into the west with absolute power. In 1682 he was appointed sheriff of Wigtonshire, and, assisted by his brother David, continued his persecutions. He was made a privy-councilor, and received the estate of Dudhope, with other honors from the king, and although on the accession of James his name was withdrawn from the privy-council it was soon restored. In 1686 he was made brigadier-general, and afterwards major-general; and in 1688, after William had landed, he received from James in London the titles of Lord Graham of Claverhouse and Viscount Dundee. When the king fled he returned to Edinburgh, but

finding the Covenanters in possession he retired to the north, followed by General Mackay. After making an attempt on Dundee, Claverhouse finally encountered and defeated Mackay in the Pass of Killicrankie (17th July, 1689), but was killed in the battle.

Graham, THOMAS, master of the mint, an eminent chemist, was born at Glasgow in 1805, and educated at Glasgow University. In 1827 he commenced teaching private mathematical classes in Glasgow, and in 1829 succeeded to the lectureship of chemistry in the Andersonian University. In 1831 he was appointed professor of chemistry in the Amsterdam University. In 1831 he established the law that gases tend to diffuse inversely as the square root of their specific gravities. He afterwards made a series of investigations into the constitution of arsenates, phosphates, and phosphoreted hydrogen, and into the function of water in different salts. In 1837 he was elected professor of chemistry in the University of London, and soon after settling in the metropolis he was appointed assayer to the mint. In 1841 he was chosen first president of the Chemical Society, which he had assisted in founding; and in 1846 he assisted in founding the Cavendish Society, over which he presided. He read the Bakerian lecture in 1849 and in 1854, the subject of both being the diffusion of liquids, which he further treated before the Royal Society in 1861. He distinguished the crystalloids and colloids in liquid solutions, and gave to their separation the name of *dialysis*. In a subsequent paper, *Philosophical Transactions*, 1866, he applied these discoveries to gases, under the name of *atmolysis*. The passage of gases through heated metal plates and the occlusion of gases were also ably investigated by him. He died in 1869.

Grahame (grām or grā'am), JAMES, a Scottish poet, born in Glasgow in 1765. He studied law in Edinburgh, and in 1791 became a Writer to the Signet. In 1795 he was admitted to the Faculty of Advocates, of which he continued a member until 1809, when he took orders as a clergyman of the Church of England. Previous to this all his literary productions had been published. While at the university he printed and circulated a collection of poetical pieces. These appeared in an amended form in 1797. In 1801 he published a dramatic poem entitled *Mary, Queen of Scotland*, and in 1802 appeared, anonymously, *The Sabbath*. The *Birds of Scotland*, and *British Georgics* followed. He subsequently held curacies at Shefton, Durham, and Sedgefield, but his health gave way, and he died at Glasgow in 1811.

Graham Island, or FERDINANDEA, a volcanic island which in July, 1831, rose up in the Mediterranean, about 30 miles southwest of Sciacca, in Sicily. It attained a height of 200 feet, with a circuit of 3 miles, but disappeared in August. It reappeared for a short time in 1863.

Graham Land, a tract of land in the Antarctic Ocean; discovered in 1832 by Biscoe, who took possession of it for Great Britain. It stretches between lat. 63° and 68° S., and lon. 61° and 68° W.; and is supposed to be of great extent.

Grahamstown, a town of Cape Colony, district of Albany, about 480 miles east of Cape Town. It is a well-built, thriving place, and is the seat of an Anglican bishop. Pop. about 15,000.

Grail (grāl; variously spelt *Greal, graal, Grazal, Grasal*, etc.), the legendary holy vessel, supposed to have been of emerald, from which Christ dispensed the wine at the last supper. It was said to have been brought to England by Joseph of Arimathea, but to have been taken back to heaven until the appearance of heroes worthy to be its guardians. Titurel, a descendant of the Asiatic prince Perillus, whose descendants had allied themselves with the family of a Breton sovereign, was chosen as its keeper. He erected for it a temple on the model of that at Jerusalem, and organized a band of guardians. It was visible only to the baptized and pure of heart. With this legend that of King Arthur became connected. Three of his knights, Galahad, Percival, and Bors, had sight of it, and on the death of Percival it was again taken to heaven.

Grain (grān), the name of a small weight, the twentieth part of a scruple in apothecaries' weight, and the twenty-fourth of a pennyweight troy. See *Avoirdupois*.

Grain includes all those kinds of grass which are cultivated on account of their seeds for the production of meal or flour. All kinds of grain contain in varying quantities the following elements: gluten, fecula or starch, a sweet mucilage, a digestible aromatic substance contained in the hulls, and moisture, which is predominant even in the driest grain, and serves, after planting, to stimulate the first motions of the germ. The grains include wheat, oats, rice, Indian corn, rye, buckwheat, barley, millet, etc. The term, corn, used in Europe, is restricted to Indian corn in United States

Grain Coast, the former name of Liberia, on the west coast of Africa. See *Grains of Paradise.*

Grain Elevator. See *Elevator.*

Graining (*Leuciscus Lancastriensis*), a fish of the dace kind, found chiefly in the Mersey and its tributaries, and in some of the Swiss lakes. The nose is more rounded than that of the dace, the eye larger, and the dorsal fin commences half-way between the point of the nose and the end of the fleshy portion of the tail. It seldom weighs more than half a pound; in habit and food it resembles the trout.

Grain-leather, dressed horse-hides, goatskins, sealskins, etc., blacked on the grain side, that is the hair side, for shoes, boots, etc.

Grain-moth, a minute moth of which two species are known, *Tinea granella* and *Butalis cerealella*, whose larvæ or grubs devour grain in granaries. The moths have narrow, fringed wings, of a satiny luster.

Grains of Paradise, Guinea grains or Malaguetta pepper, the pungent somewhat aromatic seeds of *Amomum Meleguetta*, nat. order Zingiberaceæ, a plant of tropical Western Africa. They are chiefly used in cattle medicines and to give a fiery pungency to cordials. The 'Grain Coast' of Africa takes its name from the production of these seeds in that region.

Grakle (grak'l; *Gracŭla*), a genus of birds of the order Passeres, and of the starling family (Sturnidæ), inhabiting India and New Guinea. One of the genus is the Indian mina bird (*G. musica*), which can be taught amusing tricks and can imitate the human voice. It is of a deep velvet black, with a white spot on the wing, yellow bill and feet, and two yellow wattles on the back of the head. A considerable number of other birds not belonging to this genus have also been called grakles, such as the purple grakle, or crow-blackbird of America. See *Crow-blackbird.*

Grallatores.—Head and Foot of Crane.

Grallatores (gral-a-tō'-rēs), an order of birds which formerly included the heron, ibis, stork; but these are now put into another order, and the Grallatores, properly so called, consist of the following families, namely, those of the snipe, stint, and ruff; the red-shanks, green-shanks, and sand-pipers; the curlews, phalaropes, stilts, and avocets; the plovers, oyster-catchers, turnstones, lapwings, coursers;

Grallatores.—*a*, Leg and foot of curlew. *b*, Head of snipe. *c*, Beak of avocet.

the jacanas, and bustards; the rails and coots; and the cranes. They are generally known as wading birds, as they frequent shores and banks of streams, marshes, etc., and their legs and beak are commonly rather long.

Gram, the chickpea (*Cicer arietinum*), used extensively in India as fodder for horses and cattle, and now being introduced into our Southern States.

Gramineæ (gram'i-ne-ē). See *Grass.*

Grammar (gram'ar), in reference to any language, is the system of rules, principles, and facts which must be known in order to speak and write the language correctly. *Comparative grammar* treats of the laws, customs, and forms which are shown by comparison to be common to various languages; *general* or *universal grammar*, of those laws which, by logical deduction, are demonstrated to be common to all. The divisions of grammar vary with the class and also with the method of treatment. In common English grammars the division is generally fourfold: *orthography*, which treats of the proper spelling of words, and includes orthoepy, treating of the proper pronunciation; *etymology*, which treats of their derivations and inflections; *syntax*, of the laws and forms of construction common to compositions in prose and verse; *prosody*, of the laws peculiar to verse. Although the systematization of grammar had begun in some sort in Plato's time it was chiefly to the Alexandrian writers that it owed its development. The first Greek grammar for Roman students was that of

Dionysius Thrax, in use about 80 B.C. Comparative grammar can only be said to have existed from the beginning of the nineteenth century, when the critical study of Sanskrit established the affinities of the languages of the Indo-European group.

Grammar Schools, an old name of a class of schools at which a secondary education is given, as a preparation for a university course. The term seems to have arisen from the once almost exclusive occupation of these schools in the teaching of the elements or grammar of the Latin and Greek languages. In England the character of the teaching in secondary schools, where not restricted by endowments, is necessarily influenced by the course of instruction in the universities, in which the classical element still preponderates. In Scotland, however, the grammar schools appear rather to have led the movement to adapt the higher education to the practical requirements of modern life, as also in the United States, where the term High School or College is generally used. Many of these present diplomas to graduates.

Gramme (gram), the unit of weight in France = 15.4323 grains. A decagramme or ten grammes = 5.644 drams; a hectogramme (100 grammes) = 3.527 oz.; a kilogramme (1000 grammes) = 2.205 lbs.; a myriagramme (10,000 grammes) = 22.046 lbs.

Grammont (grȧ-mon), a town of Belgium, East Flanders, 22 miles S. S. E. of Ghent, on both sides of the Dender. Chief manufactures: linen, lace, thread, paper, tobacco-pipes, etc. Pop. 11,997.

Grammont, Order of (*Grandmontains*), a monastic order established by Stephen of Thiers in 1076 at Muret, but afterwards (1124) removed to Grandmont. The order became extinct at the Revolution.

Gramont, or Grammont, Philibert, Count de, son of Anthony, duke of Grammont, born in 1621. He served under the Prince of Condé and Turenne, went to England two years after the Restoration, and was highly distinguished by Charles II. After a long course of gallantry he married, under compulsion, Miss Elizabeth Hamilton, and died in 1707. His memoirs were dictated to his brother-in-law, Anthony, Count Hamilton, who followed James II. entered the French service, and died in 1720.

Gramophone (gram'ō-fōn), an instrument for recording speech, similar in character to the phonograph. Instead of a wax cylinder, it employs a circular plate of metal covered with a film of oily matter on which the record is traced in a spiral line. This record is etched into the metal, or photographically reproduced on another sheet of metal. The sound is reproduced by causing the point attached to the diaphragm to follow the spiral record as the plate is rotated.

Grampian Mountains (gram'-pi-an), a range, or rather series of ranges and elevated masses, stretching across Scotland diagonally S. W. to N. E. for about 150 miles. With the exception of Ben Nevis, the Grampians comprise all the highest mountains in Scotland, Ben Cruachan, Ben Lomond, Ben Lawers, Schiehallion, Ben Macdhui (4296 feet), Cairngorm, Cairntoul, etc.

Grampus (gram'pus), a name for several marine cetaceous mammals allied to the dolphins, especially *Orca gladiator* of the Atlantic and North Sea, which grows to the length of 25 feet, and is remarkably thick in proportion to its length. The spout-hole is on the top of the neck. The color of the back is black; the belly is of a snowy whiteness, and on each shoulder is a large white spot. The grampus is carnivorous and remarkably voracious, even attacking the whale.

Gran (grän), a town of Hungary, at the confluence of the Gran with the Danube, 25 miles northwest of Budapest. It was the residence of the Hungarian monarchs, and their finest city till ruined by the Turks about 1613. It is an archbishop's see and has a fine cathedral. Pop. 17,909.

Granada (grȧ-nä'dȧ), a city in the south of Spain, capital of the province of Granada. The streets rise picturesquely above each other, with a number of turrets and gilded cupolas, the whole being crowned by the Alhambra (which see), or palace of the ancient Moorish kings. In the background lies the Sierra de Nevada, covered with snow. The streets, however, are narrow and irregular, and the buildings inferior to those of many other towns in Spain. The town is partly built on two adjacent hills, between which the Darro flows, traversing the town and falling into the Genil, which flows outside the walls. The cathedral is an irregular but splendid building, and the archbishop's palace and mansion of the captain-general are also noteworthy; but the special features of the town are the Alhambra, and another Moorish palace called the *Generalife*, built on an opposite hill. Granada has

NATURE'S WONDER WORK IN THE GRAND CANYON

A view of the rapids, in the canyon of the Grand River, Colorado, showing power house.

no manufactures of importance. Its university was founded about 1530, and is attended by some 1000 students. The city was founded by the Moors before 800, and from 1036 to 1234 was included in the Kingdom of Cordova. In 1235 it became the capital of the Moorish kingdom of Granada, and attained almost matchless splendor. In 1491 it remained the last stronghold of the Moors in Spain, but was taken by the Spaniards under Ferdinand and Isabella in 1492, along with the kingdom, having then a population of perhaps 500,000. Its prosperity continued almost without diminution till 1610, when the decree expelling the Moors from all parts of Spain told severely upon it, and it has never recovered. Pop. 75,900.—The province, which is partly bounded by the Mediterranean, has an area of 4928 sq. miles. Pop. 492,460.

Granada, formerly a Moorish kingdom in Spain, bordering on the Mediterranean, now represented by the three provinces, Granada, Almeria, and Malaga; area, 11,000 sq. miles. The interior is mountainous, being traversed from east to west by several ranges, particularly the Sierra Nevada; but many of its valleys and low grounds are distinguished by beauty and fertility. The olive and vine are extensively cultivated, and fruit is very abundant. The sugar-cane thrives in some parts. After long forming part of the kingdom of Cordova, Granada became a separate kingdom in 1235. In 1492 it passed into the possession of the Spaniards.

Granadilla (gran-a-dil'a), the West Indian name for the fruits of various species of *Passiflōra*, a genus of the passion-flower family. Some species have been introduced into Europe, chiefly for their flowers, the chief being the purple-fruited, *P. edūlis;* the water-lemon, *P. laurifolia;* the flesh-colored granadilla, and the *P. quadrangulāris*, the most valuable for cultivation in Great Britain.

Granby (gran'bi), JOHN MANNERS, MARQUIS OF, son of the Duke of Rutland, born in 1721; educated at Eton and Cambridge; raised a foot regiment in 1745; became colonel of horse-guards in 1758 and lieutenant-general in 1759; commanded the British troops in the Seven Years' war (1760-63), and was commander-in-chief of the British army from 1766 to 1770, the year of his death. He was elected to Parliament in 1754, 1761, and 1768.

Gran Chaco, EL (el grän chä'kō), a territory of the Argentine Republic, lying mainly between the Vermejo, Paraná, and Salado. In the west it is intersected by offsets of the Andes, and in the east forms extensive plains and marshes, while in the south are sandy deserts interspersed with salt pools. Greater part, however, is covered with primeval forest. It is inhabited by various Indian tribes, the total Indian population being estimated at from 20,000 to 40,000. The Central Chaco is well adapted for growing sugar-cane, tobacco, maize, rice, etc., but not for cereals generally. The name is also applied to a much more extensive territory of similar character extending into Bolivia and Paraguay.

Grand Army of the Republic, an organization of the Union soldiers who served in the Civil war, formed in 1866 at Decatur, Illinois. It spread to other States very rapidly, a convention held in November of that year being attended by delegates from 10 States. The second 'Encampment' was held in Independence Hall, Philadelphia, in 1868, Gen. John A. Logan, of Illinois, being elected commander-in-chief. Since that date annual conventions have been held, and since 1878 the commander has been changed annually. In 1910 an enthusiastic and well attended convention was held at Atlantic City, New Jersey, but the ranks of the veteran order had been rapidly depleted by death, and in the years to come the decrease will be very rapid. Largely through the efforts of the order service pensions have been granted to all soldiers of the war, and the veteran band is now cared for by the government. Affiliated organizations are the 'Woman's Relief Corps,' the 'Loyal Ladies' League,' and 'The Sons of Veterans.' On the 50th anniversary of the battle of Gettysburg, in July, 1913, a great reunion of the Grand Army, with Confederate veterans, was held at Gettysburg, the ceremonies including scenes representing incidents of the battle, etc.

Grand Canon of the Colorado, a deep gorge through which the Colorado River flows in Arizona, 217 miles in length and surpassing in depth and grandeur any other cañon on the earth. With the addition of Marble Cañon, with which it connects, it is 286 miles long. The summit width varies from 9 to 13 miles, and the average depth is over 5200 feet, the maximum depth being 6300 feet, a depth maintained for about 50 miles. It is believed to have been entirely excavated by the river, which is supposed to have begun its course in the surface of the plateau. Boating parties have several times gone down the chasm, though

the rapids and falls render this enterprise dangerous.

Grand Duke, a title of nobility, ranking below a king and above a duke.

Grandee (gran-dē'), in Spain a noble of the first rank, consisting partly of the relatives of the royal house, and partly of such members of the high feudal nobility as had the right to enlist soldiers under their own colors. Besides the general prerogatives of the higher nobility, and the priority of claim to the highest offices of state, the grandees possessed the right of covering the head in the presence of the king, with his permission. The king called each of them 'my cousin' (*mi primo*), while he addressed the other members of the high nobility only as 'my kinsman' (*mi pariente*).

Grand Falls, a city on Exploits River, Newfoundland, 60 miles below Red Indian Lake. It was founded in 1905. Extensive water power has been developed and it has large paper mills.

Grand Forks, a city, county seat of Grand Forks Co., North Dakota, on Red River of the North, and on Northern Pacific and Great Northern railroads, 70 miles N. of Fargo. It is the seat of the University of North Dakota, St. Bernard's Academy and Wesley College. Its products are flour, butter, ice cream, etc. Pop. (1910) 12,478; (1920) 13,950.

Grand Haven, a city, port of entry and county seat of Ottawa Co., Michigan, on Lake Michigan, at mouth of Grand River, 31 miles W. of Grand Rapids, with steamship connection with Lake ports. Among its manufactures are leather, machinery, pneumatic tools, motors, pianos, refrigerators, knit goods, gloves, novelties, printing presses, etc. It is also a summer resort. Pop. (1920) 7205.

Grand Island, a city, county seat of Hall Co., Nebraska, on the Platte River, and several railroads, 85 miles W. of Lincoln. It has the oldest beet-sugar factory in the U. S., producing ten million pounds of refined sugar annually. It is noted as a horse market; also has brick and marble works, etc. It is a division point on the Union Pacific, which has here large car shops employing about a thousand men. A Baptist college and an Old Soldiers' Home are located here. Pop. (1910) 10,326; (1920) 13,960.

Grand Junction, a city, county seat of Mesa Co., Colorado, at the junction of the Grand and Gunnison rivers, 200 miles W. S. W. of Denver, in a fruit and general farm region. The district has coal, gold, and silver deposits. Pop. (1920) 8665.

Grand Jury, a body of men selected according to the different laws of the several states, usually numbering 24, and whose duty it is to receive secretly the evidence presented regarding alleged crimes, and if satisfied that a crime has probably been committed, then to present an indictment against the accused to the proper court. As a rule, the Grand Jury is approachable only through the prosecuting officer of the district, but they have a right to take up any inquiry independently of such officer, and it is also within their power, if not their duty, to investigate in a general way the conditions of public institutions, and make presentments regarding the same.

Grand Pensionary, formerly an officer of the Dutch Republic. In the great towns the first magistrate was called a pensionary, his office being a paid one. The grand pensionary was the secretary of state of the Province of Holland. He held office for five years, and was eligible for re-election. The office was abolished on the formation of the Kingdom of Holland in 1806.

Grand Pre (grän prē), a village of King's Co., Nova Scotia, separated from Minas Basin by the Grand Pre Dyke and Long Island. It is the scene of Longfellow's poem *Evangeline.* Pop. 900. Also called Lower Horton.

Grand Prix de Paris (grän prē de pár-ē), the great event of the French racing calendar. It dates back to 1863.

Grand Rapids, a city, county seat of Kent Co., Michigan, on Grand River at the head of steam navigation, 30 miles from Lake Michigan and 150 miles N. W. of Detroit. It is traversed by several railroads and has large lumber interests. There are gypsum mines in the neighborhood. It is noted for its immense furniture factories, employing about 13,000 operatives. Other manufactures include carpet sweepers, refrigerators, brass and iron products, flour, gypsum products, and many other industries. It is on the following railroads: Pere Marquette, Michigan Central, New York Central, Grand Rapids & Indiana, and Grand Trunk. The Michigan Soldiers' Home is here, also Union Benevolent Association Home and many other philanthropic institutions. It has a fine public museum, library, court house, etc.; and is the seat of Roman Catholic and Protestant Episcopal bishoprics. The population in 1900 was 87,565; in 1910 112,571; in 1920, 137,634.

Grand Rapids, the former name of the county seat of Wood Co., Wisconsin. The name was changed to Wisconsin Rapids (q. v.) August 4, 1920. Pop. (1920) 7243.

Grand Sergeanty, an ancient tenure of land similar to knight-service, but of superior dignity. Instead of serving the king generally in his wars, the holder by this tenure was bound to do him some specified honorary service, to carry his sword or banner, to be the marshal of his host, his high-steward, butler, champion, or other officer. It was practically abolished with other military tenures by Charles II.

Grange (grānj), in the United States, a society of farmers organized for the purpose of promoting the interests of agriculture, more especially for abolishing the restraints and burdens imposed on it by the commercial classes, the railroad and canal companies, etc., and for doing away with middlemen. Granges originated in the order of Patrons of Husbandry, founded in Washington in 1867. The central body of this was called the National Grange, and subordinate granges were established in the several states until they numbered more than 27,000 in all. Women were admitted to membership on equal terms with men, and this aided greatly in the rapid growth of the order, which in 1875 had a membership of 1,500,000. It was political in its early purposes, and succeeded in having several laws passed in the interest of agriculture. It also sought to gain control of grain elevators and railroad terminal facilities. The political movement was afterwards left to the Farmers' Alliance (which see), leaving the grange to a useful growth in the social and industrial field. Its membership has much decreased, yet it remains a popular institution.

Grangemouth (grānj'muth), a seaport and police burgh, Stirlingshire, Scotland, at the entrance of the Forth and Clyde Canal, 3 miles E. N. E. of Falkirk. The town was founded in 1777 in connection with the construction of the canal; its prosperity was increased by the opening of docks in 1843, 1859, and 1882. It has shipbuilding-yards, sawmills, a rope and sail factory, and brickworks. Pop. 17,463.

Granier de Cassagnac. See *Cassagnac.*

Granilite (gran'i-līt), an indeterminate granite; variety of granite that contains more than three constituent parts.

Granilla (gran-il'a), the dust or small grains of the cochineal insect.

Granite (gran'it), an unstratified rock, composed generally of the minerals quartz, felspar, and mica, mixed up without regular arrangement of the crystals. The grains vary in size from that of a pin's head to a mass of two or three feet, but they seldom exceed the size of a large gaming die. When they are of this size, or larger, the granite is said to be 'coarse-grained.' Granite is an igneous, or fire-formed, rock which has been exposed to great heat and pressure deep down in the earth. It is one of the most abundant of the igneous rocks seen at or near the surface of the earth, and was formerly considered as the foundation rock of the globe, or that upon which all sedimentary rocks repose; but it is now known to belong to various ages from the Pre-Cambrian to the Tertiary, the Alps of Europe containing granite of the later age. In Alpine situations it presents the appearance of having broken through the more superficial strata; the beds of other rocks in the vicinity rising towards it at increasing angles of elevation as they approach it. It forms some of the most lofty of the mountain chains of the eastern continent, and the central parts of the principal mountain ranges of Scandinavia, the Alps, the Pyrenees, and the Carpathian Mountains are of this rock. It is abundant in America and is largely quarried in the United States for building purposes, especially in New England, the best known quarries being those of New England. It is abundant in South Carolina and Georgia, but much of this, as well as that of some parts of California, is in a singular state of decomposition, in many places being easily penetrated by a pick. Granite supplies the most durable materials for building, as many of the ancient Egyptian monuments testify. It varies much in hardness as well as in color, in accordance with the nature and proportion of its constituent parts, so that there is much room for care and taste in its selection. Granite in which felspar predominates is not well adapted for buildings, as it cracks and crumbles down in a few years. The decomposed felspar of some varieties of granite yields the kaolin used in porcelain manufacture. Granite in which mica is replaced by hornblende is called *syenite*, the famous Quincy granite of Massachusetts being properly a syenite. When both mica and hornblende are present it is called *syenitic granite;* when talc supplants mica it is called *protogene*,

talcose, or *chloritic granite;* a mixture of quartz and hypersthene, with scattered flakes of mica, is called *hypersthenic granite;* and the name of *graphic granite*, or *pegmatite*, is given to a variety composed of felspar and quartz, with a little white mica, so arranged as to produce an irregular laminar structure. When a section of this latter mineral is made at right angles to the alternations of the constituent materials, broken lines resembling Hebrew characters present themselves; hence the name. Granite abounds in crystallized earthy minerals; and these occur for the most part in veins traversing the mass of the rock. Of these minerals beryl, garnet, and tourmaline are the most abundant. It is not rich in metallic ores. The *oriental basalt*, found in rolled masses in the deserts of Egypt, and of which the Egyptians made their statues, is a true granite, its black color being caused by the presence of hornblende and the black shade of the mica. The *oriental red granite* chiefly found in Egypt, and of which Pompey's Pillar and Cleopatra's Needles were constructed, is composed of large grains or imperfectly formed crystals of flesh-colored felspar, of transparent quartz, and of black hornblende.

Granite City, a city in Madison County, Illinois, opposite St. Louis. It has steel foundries, lead and enameling works, box factory, brewery, machine shops, etc. Pop. 15,000.

Granja (grän'hä), La. See *Ildefonso.*

Grano (grä'nō), a coin of Malta, about 1/6 cent in value.

Gran Sasso D'Italia, or Monte Corno, a mountain of Naples, the culminating peak of the Apennines; height, 9519 feet.

Grant, in law, a gift in writing of such a thing as cannot be passed or conveyed by word only; thus, a grant is the regular method by the common law of transferring the property of incorporeal hereditaments, or such things whereof no actual delivery of possession can be had.

Grant, Frederick Dent, soldier, son of Gen. U. S. Grant, was born at St. Louis, Missouri, in 1850. He graduated at West Point in 1871, became colonel of the Fourth Cavalry, and resigned in 1881. He was appointed minister to Austria in 1885, and was police commissioner of New York, 1894-98. He was made brigadier-general of volunteers on the outbreak of the Spanish war. Served in Porto Rico, and afterward commanded the military district of San Juan; transferred to Luzon, 1901-02. He was commissioned brigadier-general in the United States army in 1901, and major-general in 1906, and has commanded the Department of the Lakes since 1908. He died April 11, 1912.

Grant, George Munro, a Canadian author, born in Nova Scotia in 1835; died in 1902. He was made principal of Queen's University, Kingston, in 1877, and wrote *Ocean to Ocean*, and edited *Picturesque Canada.*

Grant, James, novelist, born at Edinburgh in 1822. In 1846 he published his first book, *The Romance of War.* A large number of works followed, most of them concerned with military life or based on historical events, *Adventures of an Aide-de-Camp* (1848), *Bothwell* (1851), *Jane Seton* (1853), *Frank Hilton* (1855), *King's Own Borderers* (1865), *White Cockade* (1867), *British Battles on Land and Sea* (1873), *Old and New Edinburgh* (1880-83), etc. He died in 1887.

Grant, Sir James Alexander, Canadian physician, born at Inverness, Scotland, in 1831; died 1920. He was taken to Canada in childhood, educated at Queen's and McGill Universities. He was president of the Canadian Medical Association. Author of *How to Live a Hundred Years, Tuberculosis.*

Grant, Mrs. Anne, of Laggan, a Scottish author, born at Glasgow in 1755; died 1801. Her maiden name was McVicar. She first won recognition by her *Letters from the Mountains*, a series of letters describing her life in the Highlands, the character of the people, and the natural scenery. Her chief subsequent works are *Memoirs of an American Lady, Essays on the Superstitions of the Highlanders of Scotland.*

Grant, Ulysses Simpson, general and president of the United States, born in 1822, at Point Pleasant, Clermont County, Ohio. His real name was Hiram Ulysses Grant, the name afterwards used by him having arisen out of an error in the registration of his cadetship. After graduating in the military academy at West Point, he served during the Mexican war, taking part in every battle except Buena Vista, and being breveted captain for gallantry. In 1854 he resigned his commission and engaged first in farming near St. Louis, and then in the leather trade with his father at Galena, Illinois. On the outbreak of the war in 1861 he assisted in the organization of troops and when the 21st Illinois was formed he was made colonel. He seized Paducah, commanding the Tennessee and Ohio divisions; checked the departure of reinforcements

from Belmont, captured Fort Henry and Fort Donelson with their garrisons. Grant was thereupon promoted to the rank of major-general of volunteers and assigned to the district of West Tennessee. On April 6-7, 1862, he won the battle of Shiloh, the first great engagement of the war. He took part in the operations against Corinth and later assumed conduct of operations in that region. On October 16th, he was advanced to the command of the Department of the Tennessee. In November he commenced operations against Vicksburg, Mississippi. After a siege of forty-seven days (May 18 to July 4, 1863) the town surrendered with its large garrison. The important victory at Chattanooga, which followed, opened the way into Georgia for the Federal troops. In March, 1864, he was appointed lieutenant-general, and assumed command of all the armies of the United States. In a succession of

General Grant

hotly-contested battles at the Wilderness, Spottsylvania, North Anna, and Cold Harbor, he steadily advanced on Petersburg and Richmond, investing Petersburg and carrying on a protracted siege which continued for many months. The Confederate works were flanked at the end of March, 1865, and Lee's retreating army was pursued, surrounded, and forced to surrender, April 9, 1865. This event practically ending the war. In 1866 Grant was raised to the supreme rank of general, specially revived for his honor, and in 1868 was elected President of the United States. His administration allayed the soreness which still survived from the great struggle between the states, and was also noteworthy for the reduction of the national debt and the settlement of the Alabama dispute with England. He was re-elected in 1872. After his retirement in 1877 he made a journey around the world and was received everywhere with the highest honor, as one of the greatest of modern soldiers. Later he became involved in a financial concern which exploited his name and left him heavily in debt. He manfully endeavored to repair his fortune by writing and publishing his *Memoirs*, and in this he was successful, though suffering greatly from the cancerous disease of which he died at Mt. McGregor, New York, July 23, 1885. He was buried at Riverside, New York, August 8, 1885, in a handsome mausoleum built by the voluntary contributions of his admiring fellow-citizens.

Grantham (grant'am), a municipal and parliamentary borough of England, in Lincolnshire, 22½ miles S. S. W. of Lincoln. It is well built, principally of brick, and has a fine Gothic church of the thirteenth century, with a tower and spire 273 feet high Pop. (1911) 20,074.

Granulation (gran-ū-lā'shun), the subdivision of a metal into small pieces or films. It is employed in chemistry to increase the surface, so as to render the metal more susceptible to the action of reagents, and in metallurgy for the subdivision of a tough metal like copper. Small shot is made by a species of granulation.

Granulation, in surgery, the formation of little grain-like fleshy bodies on the surfaces of ulcers and formerly suppurating wounds, serving both for filling up the cavities and bringing nearer together and uniting their sides. The color of healthy granulations is a deep florid red. When livid they are unhealthy, and have only a languid circulation.

Granvella, or GRANVELLE (gran'vel), ANTOINE PERRENOT, CARDINAL DE, minister of state to Charles V and Philip II of Spain, was born in 1517 near Besançon. He studied at Padua and at Louvain, in his twenty-third year was appointed Bishop of Arras, and was present at the diets at Worms and Ratisbon. In 1545 he was sent to the Council of Trent, and on the death of his father in 1550 was appointed by Charles V to succeed him in the office of chancellor. In 1552 he negotiated the Treaty of Passau, and in 1553 arranged the marriage of Don Philip with Mary Queen of England. Under Philip II he remained chief minister, and in 1559 negotiated the Peace of Câteau-Cambrésis. Philip immediately after quitted the Netherlands, leaving Margaret of Parma as governor, and Granvella as her minister. In 1560 he became Archbishop of

Mechlin, and in 1561 was made a cardinal; but in 1564 he was obliged to yield to the growing discontent aroused by his tyranny in the Netherlands, resign his post, and retire to Besançon. In 1570 Philip sent him to Rome to conclude an alliance with the pope and the Venetians against the Turks, and afterwards to Naples as viceroy. In 1575 he was recalled to Spain, and placed at the head of the government with the title of President of the Supreme Council of Italy and Castile. In 1584 he was created Archbishop of Besançon, and died at Madrid in 1586. He preserved all letters and despatches addressed to him, nine volumes of which, published 1851-62, are of value in illustrating the history of the sixteenth century.

Granville (grăn-vēl), a fortified seaport of France, department of Manche, at the mouth of the Boscq, in the English Channel. Pop. 11,629.

Granville (gran'vil), GRANVILLE GEORGE LEVESON-GOWER, 2D EARL, an English statesman, was born in London in 1815; educated at Eton and Christ Church, Oxford entered Parliament in 1836. In 1840 he became under-secretary for foreign affairs, and in 1846 succeeded to the peerage. In 1868 he was colonial secretary under Gladstone and in 1870 he became secretary for foreign affairs, which he held until 1874. During this period he negotiated the Treaty of 1870, guaranteeing the independence of Belgium, and 'protested' against the Russian repudiation of the Black Sea clause of the Treaty of Paris. He died in 1891.

Grape (grāp). See *Vine*.

Grapefruit, a tropical and semi-tropical fruit of the genus citrus, the size of the fruit varying from that of a large orange to 6 or 7 inch diameter. It grows from California to the West Indies and is extensively cultivated in Florida. The name comes from the fact that the fruits, despite their large size grow in clusters like grapes. The round variety, also known as Pomelo, is widely used as a dessert fruit. Another form, the Shaddock, is of pear shape and is seldom used as food.

Grape-shot.

Grape-shot, a kind of shot generally consisting of three tiers of cast-iron balls arranged, three in a tier, between four parallel iron discs connected together by a central wrought-iron pin, Case-shot is now more used than grape-shot.

Grape-sugar. See *Glucose*.

Graphite (graf'īt), one of the forms under which carbon occurs in nature, also known under the names of *Plumbago*, *Black Lead*, and *Wad*. It occurs not infrequently as a mineral production, and is found in great purity at Borrowdale in Cumberland, and in large quantities in Canada, Ceylon, and Bohemia. Graphite may be heated to any extent in close vessels without change; it is exceedingly unchangeable in the air; it has an iron-gray color, metallic luster, and granular texture, and is soft and unctuous to the touch. It is used chiefly in the manufacture of pencils, crucibles, and portable furnaces, in burnishing iron to protect it from rust, for giving a smooth surface to casting molds, for coating wax or other impressions of objects designed to be electrotyped, and for counteracting friction between the rubbing surfaces of wood or metal in machinery.

Graphophone (graf'o-fōn), an apparatus for recording and reproducing sound, invented by Charles Sumner Tainter and Chichester A. Bell, cousin of Alexander Graham Bell (q. v.), in 1885. It was the first practical and commercially usable talking machine. In principle it is the same as the early cylinder phonograph (q. v.) constructed by Edison in 1877; but Tainter and Bell were the first to use the wax cylinder. Graphophones are now equipped with disks, but the cylinder machines (see *Dictograph*) are much in use for office work.

Graphotype (graf'o-tīp), a process for obtaining blocks for surface printing, discovered in 1860 by De Witt Clinton Hitchcock, who observed that, on rubbing the enamel from a visiting-card with a brush and water, the printed letters stood out in relief, the ink having so hardened the enamel that it resisted the action of the brush. The first graphotype drawings were made on blocks of chalk with siliceous ink, but the chalk-block was soon superseded by the use of French chalk ground to the finest powder, laid on a smooth plate of zinc, submitted to intense hydraulic pressure, and then sized. The drawing is made with sable-hair brushes and ink composed of lamp-black and glue, and when finished is gently rubbed with silk velvet or fitch-hair brushes until the chalk between the ink lines is removed to the depth of ⅛ inch. The block is then hardened by being steeped in an alkaline silicate, and

Tampa Board of Trade.

GRAPEFRUIT TREE

Borne in clusters like the grape, hence the name, the grapefruit is cultivatcd extensively in Florida, California and most tropical countries.

molds being taken from it, stereotype plates are cast for printing.

Grapnel (grap'nel), or GRAPLING, a sort of small anchor, fitted with four or five flukes or claws, and commonly used to fasten boats or other small vessels. The name was also given to the grappling-iron formerly used in naval engagements to hold one ship to another.

Grapple Plant (grap'l), the Cape name of the *Harpagophytum procumbens*, a South African procumbent plant of the nat. order Pedaliaceæ. The seeds have many hooked thorns, and cling to the mouths of grazing cattle, causing considerable pain.

Graptolite (grap'tu-līt), one of a genus (*Graptolithus*) of fossil hydrozoa, agreeing with the living sertularians in having a horny polypary, and in having the separate zooids protected by little horny cups, all springing from a common flesh or cœnosarc, but differing in that they were not fixed

Block of Stone containing Graptolites.

to any solid object, but were permanently free. Graptolites usually present themselves as silvery impressions on hard black shales of the Silurian system, presenting the appearance of fossil pens, etc., whence the name.

Graslitz (gräs'litz), a town of Bohemia, on the Zwoda, 89 miles W. N. W. of Prague. It has important manufactures. Pop. 11,803.

Grasmere (gràs'mēr), a beautiful lake of England, county of Westmoreland, of oval form, about 1 mile long by ½ mile broad. The village of Grasmere is at the head of the lake.

Grass (gràs), a name equivalent to the botanical order Graminaceæ, a very extensive and important order of endogenous plants, comprising about 250 genera and 4500 species, including many of the most valuable pasture-plants, also those which yield corn, the sugar-cane, the tall and graceful bamboo, etc. The nutritious herbage and farinaceous seed furnished by many of them render them of incalculable importance, while the stems and leaves are useful for various textile and other purposes. The roots are fibrous; the stem or culm is usually cylindrical and jointed, varying in length from a few inches to 80 or 90 feet, as in the bamboo (in the sugar-cane and maize the stem is solid, but porous), and coated with silex; leaves, one to each node or joint, with a sheathing petiole; spikelets terminal, panicled, racemose, or spiked; flowers hermaphrodite or polygamous, destitute of true calyx or corolla, surrounded by a double set of bracts, the outer constituting the *glumes*, the inner the *paleæ;* stamens hypogynous, three or six; filaments long and flaccid; anthers versatile; ovary solitary, simple, with two (rarely three) styles, one-celled, with a single ovule; fruit known as a *caryopsis*, the seed and the pericarp being inseparable from each other. The more important divisions of the natural order of grasses are: (1) *Panicaceæ*, including the *Paniceæ* (millet, fundi, Guinea grass); the *Andropogoneæ* (sugar-cane, dhurra, lemon-grass); the *Rottboellieæ* (gama-grass); etc. (2) *Phalarideæ* (maize, Job's tears, canary-grass, foxtail-grass, soft-grass, Timothy grass. (3) *Poaceæ*, including the *Oryzæ* (rice); *Stipeæ* (feather-grass, esparto); *Agrosteæ* (bent-grass); *Aveneæ* (oats, vernal grass); *Festuceæ* (fescue, meadow-grass, manna-grass, teff, cock's-foot grass, tussac grass, dog's-tail grass); *Bambuseæ* (bamboo); *Hordeæ* (wheat, barley, rye, spelt, rye-grass, lyme-grass). In its popular use the term grasses is chiefly applied to the pasture grasses as distinct from the cereals, etc.; but it is also applied to some herbs, which are not in any strict sense grasses at all, *e. g.* ribgrass, scurvy and whitlow grass. After the culture of herbage and forage plants became an important branch of husbandry, it became customary to call the clovers, trefoils, sainfoin. and other flowering plants grown as fodder, *artificial grasses*, by way of distinction from the grasses proper, which were termed *natural grasses*. Of the pasture grasses, some thrive in meadows, others in marshes, on upland fields, or on bleak hills, and they by no means grow indiscriminately. Indeed, the species of grass will often indicate the quality of the soil; thus, *Holcus*, *Dactylis*. and *Bromus* are found on sterile land, *Festūca* and *Alopecūrus* on a better soil, *Poa* and *Cynosūrus* are only found in the best pasture land. See *Dog's-tail Grass*, *Fescue*, *Foxtail*, *Meadow-grass*, *Tussac*, etc.

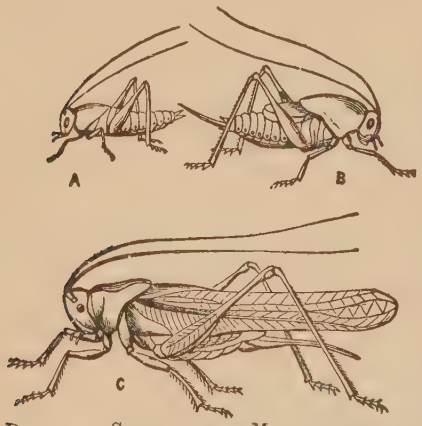
Grass-cloth, the name of certain beautiful light fabrics made in the East from the fiber of *Boehmeria nivea*, or China grass, *Bromelia Pigna*, etc. None of the plants yielding the fiber are grasses. The Queensland

grass-cloth plant, of the nettle order, yields a fine, strong fiber. Cloth has been made from bamboo, and a coarse matting from esparto, both of which are true grasses.

Grasse (grâs), a town of France, department of Alpes Maritimes, 23 miles E. N. E. of Draguignan. It has extensive manufactures of perfumery. There are immense gardens of roses and orange flowers around the town, millions of pounds of flowers being gathered annually for use in perfume-making. Pop. (1911) 19,704.

Grass-finch, Grass-quit, names given to several birds belonging to the finch family, so called from feeding chiefly on the seeds of grasses.

Grass'hopper, the name of various leaping insects of the order Orthoptera nearly akin to the locusts. They are characterized by very long and slender legs, the thighs of the hinder legs being large and adapted for leaping, by large and delicate wings, and by the wing-covers extending far beyond the extremity of the abdomen. Grasshoppers form an extensive group of insects, and are distinguished by the power which



Different Stages in the Metamorphosis of a Grasshopper.

A, larva; *B*, pupa, with the rudimentary wings; *C*, adult, or imago, with the fully developed wings.

they possess of leaping to a considerable distance, and by the stridulous or chirping noise the males produce by rubbing their wing-covers together. They are generally of a greenish color.

Grass of Parnassus, a genus of plants, variously referred to the natural orders Droseraceæ and Hypericaceæ, and found for the most part in boggy situations in the colder northern countries. The common grass of Parnassus (*Parnassia palustris*) is a beautiful autumnal plant with heart-shaped leaves and a single yellowish-white flower.

Grass-oil, Oil of Geranium or Oil of Spikenard, a fragrant volatile oil, used chiefly in perfumery, and obtained from Indian grasses of the genus *Andropogon*.

Grass-tree, the popular name of a genus of Australian plants (*Xanthorrhœa*) of the nat. order

Grass-tree (*Xanthorrhœa hastilis*).

Liliaceæ, having shrubby stems with tufts of long, grass-like, wiry foliage, from the center of which arise the tall flower-stalks, which sometimes reach the height of 15 or 20 feet, and bear dense cylindrical spikes of blossom at their summit. The base of the leaves forms, when roasted, an agreeable article of diet, and the leaves themselves are used as fodder for all kinds of cattle. A resin, known in commerce as *akaroid resin*, is obtained from all the species, which are also popularly known as black-boys.

Grass-wrack, or Sea-grass (*Zostĕra marina*), a phanerogamous plant belonging to the Naiadeæ, forming green beds at the bottom of the sea where it is of no great depth. When dried it is used for stuffing mattresses, and packing goods. It has been recommended as a substitute for cotton. The ash contains soda.

Gratian (grā'shе-an), otherwise Gratianus Augustus, a Roman emperor, eldest son of the Emperor Valentinian I, was born A.D. 359, and when only eight years of age raised by his father to the rank of Augustus. On the death of Valentinian in 375 the Eastern Empire remained subject to Valens, and Gratian was obliged to share the western part with his half-brother, Valentinian II, then four years old. In 378 he succeeded to the Eastern Empire.

which he bestowed on Theodosius I. He was deserted by his soldiers while leading them against Maximus, and put to death at Lyons in the eighth year of his reign.

Gratian, otherwise FRANCISCUS GRATIANUS, a Benedictine of the twelfth century, a native of Chiusi, and author of the *Decretum*, or *Concordia discordantium Canonum*, a rich storehouse of the canon law of the middle ages.

Gratiola (gra-ti'u-la), a genus of plants, the hedge-hyssop genus, nat. order Scrophulariaceæ, containing about twenty species of herbs, widely dispersed through the extratropical regions of the globe. *G. officinalis* grows in meadows in Europe. It is extremely bitter, and acts violently both as a purgative and emetic, and in overdoses it is a violent poison. *G. Virginica* is a native of the United States and has somewhat similar properties, as also *G. Peruviana*, of South America.

Grattan, HENRY, an Irish orator and statesman, born at Dublin in 1746, educated at Trinity College and Middle Temple; called to the Irish bar in 1772, and in 1775 elected member for Charlton in the Parliament of Ireland. In 1780 he moved resolutions asserting the crown to be the only link between Britain and Ireland, and in 1782 led the volunteer movement, which was instrumental in securing the concession of independence to Ireland. For these services the Irish Parliament voted him £50,000 and a house and lands. The corruption of its members and the uncertain relations with England resulted in the failure of 'Grattan's Parliament.' Grattan himself became opposed to the popular feeling as represented by the United Irishmen, and in 1797 temporarily seceded from Parliament, and lived in retirement. In 1800 he came forward as member for Wicklow to oppose the Union, and on the passage of Pitt's measure was returned to the imperial Parliament in 1805 for Malton in Yorkshire, and in 1806 for Dublin. He supported the war policy of the administration, but was latterly chiefly occupied in promoting Catholic emancipation. He died in 1820, and was interred in Westminster Abbey.

Gratz, or GRAZ (grāts), a town of Austria, capital of Styria, picturesquely situated on the Mur, 90 miles southwest of Vienna. The older town, on the left bank, is connected with the suburbs of Lend and Gries on the right by several bridges, besides a railway bridge. The Schlossberg rises 400 ft. above the river, but the fortifications of the town have given place to avenues and pleasure grounds. The cathedral of St. Ægidius, built in 1456, is a majestic Gothic structure with a fine altar and paintings; near it is the mausoleum of Ferdinand II. The university, founded in 1586, has over 1100 students and a library of 80,000 vols. The Joanneum, for the promotion of agriculture and scientific education, has a large library and museums. The manufactures consist of steel and iron ware, soap, confectionery, beer, etc. Pop. (1911) 151,781.

Grätz (grets), HEINRICH, a Jewish historian, born at Xions, Posen, in 1817; died in 1891. In 1854 he became professor in the Jewish theological seminary at Breslau, and in 1870 a professor at the university. His *Geschichte der Juden* (11 vols. 1853–70; new ed. 1865–90; trans. by Bella Löwy, 6 vols. 1891–98) is the standard work on the history of the Jews.

Graudenz (grou'dents), a town of Germany, West Prussia, right bank of the Vistula, 18 miles S. S. W. of Marienwerder. The manufactures include machinery, castings, cigars, tobacco, tapestry, flour, etc., and there are breweries and distilleries. Pop. 40,313.

Gravel (grav'el), a deposit of rounded, water-worn stones. Gravels are produced by the action of moving water, usually of streams or of the sea. In course of time gravels may become consolidated by cementing agents and by pressure and then form 'conglomerate.' The pebbles in a gravel may consist of any kind of rock, but most commonly they are of quartz. In addition to marine and fluviatile gravels, a third group is often recognized—the glacial gravels. These are partly due to the action of running waters, emerging from the melting ice-sheets and glaciers, which wash out the finer materials from the glacial debris. Gravel is extensively used for making concrete and mortar, and as road material. In pathology, gravel consists of small concretions or calculi in the kidneys or bladder. See *Calculus*.

Gravelines (grâv-lēn), a small seaport and second-class fortress of France, department Nord. Pop. 6284.

Gravelotte (grâv-lot), a village of Germany, province of Elsass-Lothringen, 7 miles west of Metz, the scene of one of the fiercest battles of the Franco-German war, resulting in the retreat of the French to Metz.

Grave Mounds, extensive mounds found in many parts of the United States, especially in the Ohio and Mississippi Valleys, in which occur remains of the old inhabitants, with flint arrowheads and pottery.

They are attributed to a race known as Mound Builders and now supposed to have been the ancestors of the present Indians. Some of these mounds are of great size and occasionally they take the shape of animals. See *Mound Builders.*

Graver. See *Engraving.*

Gravesend (grāvz'end), a municipal and parliamentary borough of England in Kent, on the south bank of the Thames, 21 miles east of London. It is a great rendezvous for shipping, the boundary port of London, and troops and passengers frequently embark there to avoid the passage down the river. In the vicinity are extensive market gardens. There is some trade in supplying ships' stores, and boat-building, iron-founding, etc., are carried on. Pop. 28,117.

Gravina (grȧ-vē'na), a town of South Italy, province of Bari, on the Gravina. It has a cathedral, convents, and a college. Pop. 18,685.

Graving (grāv'ing), the act of cleaning and repairing a ship's bottom. At seaports this is usually done in a drydock called a *graving-dock.* See *Docks.*

Gravitation (grav-i-tā'shun), the force by reason of which all the bodies and particles of matter in the universe tend towards one another. According to the law of gravitation discovered by Newton, every portion of matter appears to attract every other portion with a force directly proportional to the product of the two masses, and inversely proportional to the square of the distance between them. Kepler had given the laws, deduced from observation, according to which the planets describe their orbits. From these Newton deduced the laws of the force in the case of the planets; and subsequently he generalized the statement of them, by showing the identity of the nature of the force that retains the moon in her orbit, with that which attracts matter near to the surface of the earth. He denied, however, that such a force as attraction could exist and held that the seeming attraction was due to some form of ether pressure or other external cause. The application of the grand law that he had discovered subsequently occupied a large part of the mathematical labors of Newton. Attacking the problem of *lunar inequalities,* he accounted for them by considering the perturbations due to the attraction of various bodies of the solar system; and by accounting for all the observed perturbations by means of his newly-discovered law he confirmed the truth of the law itself in such a way as to put it beyond all question. The computation of these various attractions has reached such a degree of accuracy in the hands of mathematicians since Newton, that the most complicated motions of the heavenly bodies can be predicted. The law has also been applied successfully in weighing the planets, explaining the paths of comets, the motions of the tidal wave, etc. It has also been demonstrated to hold good in the case of comparatively small bodies. Thus Maskelyne determined the attraction of a particular mountain, and Cavendish and Bailly measured the attraction of balls of lead on light, finely-balanced bodies, and thus determined the mean density of the earth.

Gravity (grav'i-ti), the term applied to the force with which the earth is held to attract every particle of matter. The force of gravity is least at the equator, and gradually increases as we recede toward the poles. Thus a given mass, if tested by means of a spring-balance of sufficient delicacy, would appear to weigh least at the equator, and would seem to get heavier and heavier as the latitude increases. This is due to two causes: first, the centrifugal force at the equator is greater than that in high latitudes, because of the greater radius of the circle described at that place; and, second, the attraction is diminished by the greater distance of objects on the surface from the earth's center. From both causes combined a body which weighs 194 lbs. at the equator would weigh 195 lbs. at either pole. Experiments to determine the force of gravity from point to point are made by determining the length of a pendulum that beats seconds at each place. By experiments made by Captain Kater at Leith Fort it was found that the force of gravity at that place is such that a body, unresisted by air or otherwise, would acquire in one second, under its influence, a velocity of 32.207 feet per second. At Greenwich the acceleration is 32.1912 feet.

Gravity, Specific. See *Specific Gravity.*

Gray (grā), a town of France, department of Haute-Saône, on the Saône. It has an active trade. Pop. 6826.

Gray, Asa, botanist, born in 1810 at Paris, Oneida County, New York; died in 1888. He was appointed Fisher professor of natural history in Harvard University in 1842, and held the chair till 1873, when he retired from its more active duties. He gained great eminence as a botanist, his works including *Elements of Botany* (1836), *A Manual*

STOKE POGIS CHURCH WHERE GRAY'S ELEGY WAS WRITTEN

of Botany (1848), and other botanical text-books; also portions of works on the flora of North America and the *Genera Boreali-Americana, a Free Examination of Darwin's Treatise* (1861), a volume entitled *Darwiniana* (1876), etc.

Gray, David, a Scottish poet, born at Merkland, Dumbartonshire, in 1838; studied at Glasgow University, from which he went, with Robert Buchanan, to London in 1860 to try his fortune in literature. After a brief struggle consumption set in, and he died at Merkland in 1861. A small volume containing the poem entitled *The Luggie*, some lyrics, and a few sonnets, with the title *In the Shadows*, represents the whole of his work.

Gray, Elisha, electrician, born at Barnesville, Ohio, in 1835; died in 1901. He was one of the inventors of the telephone, and applied for a caveat for a patent on the same day with A. G. Bell who preceded him only a few hours. He subsequently made improvements in the telephone and invented improved methods of telegraphy.

Gray, George, legislator, was born at Newcastle, Delaware, in 1840, and was admitted to the bar in 1863. He became Attorney-General of Delaware in 1879 and was elected United States Senator in 1885. In 1898 he was appointed a member of the Spanish-American Peace Commission, and was made a U. S. circuit judge in 1889. He was appointed a member of the Permanent Court of Arbitration at The Hague in 1900 and was chairman of the Coal Strike Commission of 1902. He was also a member of the Fisheries Arbitration Commission of 1910.

Gray, Thomas, an English poet, born in London in 1716; educated at Eton with Horace Walpole, and at Cambridge. In 1738 he entered himself at the Inner Temple, but accompanied Walpole in his tour of Europe until they quarreled in Italy. He returned to England in 1741, and on the death of his father took up his residence at Cambridge. In 1747 his *Ode on a Distant Prospect of Eton College* appeared, and in 1751 his famous *Elegy Written in a Country Churchyard*, which went through four editions in two months. In 1757 he declined the laureateship, and the same year published his odes, *On the Progress of Poesy*, and *The Bard*. In 1759 he removed to London, where he resided for three years, and in 1768 the Duke of Grafton presented him with the professorship of modern history at Cambridge. He died in 1771, and was buried at Stoke Pogis, Buckinghamshire. His chief poems other than those mentioned were the *Ode for Music* and a fragmentary essay on the *Alliance of Education and Government*. In Latin verse he is surpassed by few, and his letters are admirable specimens of the epistolary style.

Gray, a color intermediate between black and white.

Gray-lag, a popular name for the *Anser ferus*, or common wild goose. See *Goose*.

Grayling (grā'ling), a genus of fishes of the family Salmonidæ. The common grayling (*Thymallus vulgāris*) is found in many English streams, and is scattered over Europe from Lapland to North Italy, and also over part of Asia. The grayling prefers rapid streams where the water is clear and cool, and the bottom sandy or pebbly, and it requires, on the whole, deeper water than the trout, to which it has a certain similarity in habit. The general color is yellowish brown, including the fins; several deeper brown lines run along the body; under the belly white. The color often varies in different streams. It is a favorite fish of the angler. In North America there is a grayling of different species, *T. tricolor*, which is not only delicate eating, but also furnishes good sport.

Grayling (*Thymallus vulgāris*).

Gray-owl, the tawny-owl (*Strix stridula*), inhabits Northern Europe and America.

Graywacke (grā-wak'e), a metamorphic sandstone in which grains or fragments of various minerals, as quartz and felspar, or of rocks, as slate and siliceous clay rocks, are embedded in an indurated matrix which may be siliceous or argillaceous. The colors are gray, red, blue, or some shade of these. The term, as used by the earlier writers, included all the conglomerates, sandstones, and shales of the older formations, when these had been subjected to considerable change. At first it was nearly synonymous with the Silurian strata, these, especially in Scotland, yielding the only genuine graywacke. The term is now little used.

Great Barrier Reef, a vast natural breakwater which skirts the coast of Queensland, Australia. It is chiefly of coral formation

and is more than 1000 miles in length.

Great Barrington, a town of Berkshire Co. Mass., on the Housatonic River, 20 miles S. S. W. of Pittsfield, in the picturesque Berkshire Hills. It is a summer resort with many handsome estates; also a trade center, with manufactures of paper, textiles, and other products. Here occurred the first armed resistance to British rule in America. William Cullen Bryant, who lived here for some years, made the territory the theme of some of his poems. Pop. (1920) 6315.

Great Basin, an extensive plateau between the Wasatch and the Sierra Nevada Mountains, comprising the western part of Utah, southern Oregon, nearly all of Nevada, and eastern California; area about 210,000 square miles. Numerous mountain ridges cross it. It is so called from the fact that none of its waters reach the sea, but sink into the sands, evaporate, or flow into some saline lake. Chief among these is the Great Salt Lake of Utah.

Great Bear Lake. See *Bear Lake.*

Great Britain. See the articles *Britain, England, Scotland,* and *Wales.*

Great Circle Sailing, or TANGENT SAILING, a method of navigating a vessel according to which her course is always kept as nearly as possible on a great circle of the sphere, that is, a circle which has for its center the center of the sphere. An arc of such a circle joining two places gives the shortest distance between them, consequently the course of a vessel sailing on this arc will be the shortest possible. A simple instrument called a spherograph is employed for finding the great circle course between places, and this is accompanied by tables compiled for the same purpose.

Great Dane, also called Ulmer dog or German mastiff, a strong handsome dog, which may reach 33 in. in height at the shoulder, carrying the head and neck high, with prick ears. It unites the strength of the mastiff with the elegance of the greyhound. It hunts chiefly by sight, but is usually a kindly, companionable dog, and is in Britain rarely employed in the chase. The hair is short, hard, and dense, the color various shades of gray ('blue'), red, black, or white, with patches of the other colors.

Great Eastern, an iron steamship, length, 680 feet; breadth, 82½, or, including paddle-boxes, 118 feet; height, 58 feet (70 to top of bulwarks). It had six masts, five of iron and one of wood, and could spread 7000 yards of sail, besides having eight engines, divided between the screws and paddles, and capable of working at 11,000 horse-power. Its career was unfortunate, its principal interesting employment being to lay the Atlantic telegraph cable of 1865–66, for which its size and steadiness specially qualified it. Finally, after being used for some time as a show ship, it was sold at auction in 1888 and broken up.

Great Falls, a city, county seat of Cascade Co., Montana, on the Missouri River, 70 miles N. E. of Helena, in a mining and farming district, with extraordinary water power. Among its great industrial plants is the Anaconda smelter, employing nearly 3000 men. Other industries are ferro-manganese plant, flour mills, packing plants, creameries, and manufactures of automobiles, rubber, farm implements, paper, coal, lumber, etc. Pop. (1910) 13,948; (1920) 24,121.

Great Fish River, a river of Southeast Africa, near the eastern frontier of Cape Colony. It rises in the Snowy Mountains, and falls into the sea after a course of 230 miles.

Great Fish, or BACK RIVER, a river of Northern Canada, rising in Sussex Lake, and flowing, after a course of about 500 miles, into Cockburn Bay, an inlet of the Arctic Ocean; discovered by Sir George Back.

Great Lakes, a chain of five lakes, forming part of the boundary line between the United States and Canada. See *Erie. Huron, Michigan, Ontario, Superior.*

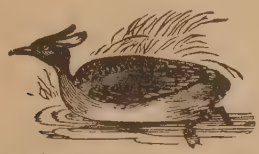
Great Salt Lake, a lake of Utah, 4000 feet above sea-level, 75 miles in length north to south, with a maximum width of 50 miles. Formerly it covered a much larger area, and had an outlet to the ocean through the Columbia River. The water is so saline that fauna and flora are exceedingly scanty. The specific gravity is so high that the human body cannot sink. Industrially the lake is of great importance for the manufacture of salt. Its chief inlets are the Bear, Ogden, Weber and Jordan river of the Great Basin. It is crossed by the 'Lucin Cut-off' of the Southern Pacific Railroad, which runs on a trestle with 20 miles of 'fill.' There are nine islands in the lake, of which one, Antelope Island, is 18 miles long.

Great Slave Lake. See *Slave Lake.*

Greaves (grēvz), armor worn in mediæval wars on the front of

the lower part of the legs, across the back of which it was buckled.

Grebe (grēb), the common name of the birds of the genus *Podiceps*, family Colymbidæ, characterized by a straight, conical bill, no tail, tarsus



Horned Grebe (*Podiceps cornūtus*).

short, toes flattened, separate, but broadly fringed at their edges by a firm membrane, and legs set so far back that on land the grebe assumes the upright position of the penguin. The geographical distribution of the genus is very wide, these birds haunting seas as well as ponds and rivers. They are excellent swimmers and divers; feed on small fishes, frogs, crustaceans, and insects; and their nests, formed of a large quantity of grass, etc., are generally placed among reeds and sedges, and rise and fall with the water. Five species are European and nine are North American, some of them (crested grebe, horned grebe) being the same as those of Europe. The great crested grebe is about 21 to 22 inches long, and has been called satin grebe from its beautiful silvery breast-plumage, much esteemed as material for ladies' muffs.

Greece (grēs), a country, now a kingdom, of Southeastern Europe, the earliest portion of this continent to attain a high degree of civilization, and to produce works of art and literature of a high type. It forms the southern extremity of what is called the Balkan Peninsula, and itself partly consists of a well-marked peninsula, the Morea or Peloponnesus, united to Northern Greece by the Isthmus of Corinth. The name Greece (Latin, *Græcia*) is of Roman origin, the native name for the country being *Hellas*, and the people calling themselves *Hellēnes*. Anciently Hellas was used in a wider sense, so as to include both Greece itself and all countries that had become Greek by colonization. Modern Greece is separated from Albania, Servia and Bulgaria on the north by an artificial boundary extending from the Ionian Sea to a point beyond Kavala on the Ægean Sea, and comprises rather less than ancient Greece, which also took in part of what is now Albania. Ancient Greece was divided into a number of independent states or territories, namely, in Northern Greece, Thessaly, Epirus (not in the modern kingdom), Locris, Phocis, Bœotia, Ætolia, Acarnania, Attica, Megaris; in the Peloponnesus, Corinth, Argolis, Achaia, Elis, Messenia, Laconia (Sparta), and Arcadia, the last entirely inland. These names are still kept up, but the country is now divided into nomes, or *nomarchies*, some of which are formed of the Greek islands, namely, Eubœa, Corfu, Cephalonia, Zante, and the Cyclades. The total area is 46,522 square miles; the population 4,600,000.

Physical Features.—Greece proper is remarkable for the extent of its coastline, formed by numerous gulfs which penetrate into it in all directions. The largest, the Corinthian Gulf, or Gulf of Lepanto, on the east, and the Saronic Gulf, or Gulf of Ægina, on the west, which nearly meet at the Isthmus of Corinth, separate Northern Greece from the Morea. This isthmus, however, has recently been pierced by a ship-canal and is no longer an obstruction to commerce. Another striking feature is the mountainous character of the interior. On the north are the Cambunian Mountains, with Mount Olympus (9754 ft.) at their eastern extremity. From this range a lofty chain, called Mount Pindus, runs southwards almost parallel to the eastern and western coasts of Greece. At a point in this chain called Mount Tymphrestus or Typhrestus (Mount Velukhii) two chains proceed in an easterly direction, the northern being called Mount Othrys, the southern terminating at Thermopylæ, Mount Œta (8240 ft.). The Cambunian Mountains, Pindus and Othrys, enclose the fertile vale of Thessaly, forming the basin of the Peneus (Salambria), and the ranges of Othrys and Œta inclose the smaller basin of the Sperchius (Hellada). Another range, that of Parnassus (highest summit 8068 ft.), branches off from Mount Œta and runs still more to the south. The peaks of Cithæron, Parnes, Pentelicus, and Hymettus lie in the same direction, and the range in which they are found is continued to the southeast point of continental Greece. This range on the south and that of Œta on the north enclose the basin of the Cephissus, with Lake Copais. The chief rivers on the west side of the Pindus chain are the Arachtus (Arta) and the Achelōus (Aspropotamo). The chief feature in the mountain system of the Peloponnesus is a range or series of ranges forming a circle round the valley of Arcadia in the interior, having a number of branches proceeding outwards from it in different directions. The highest range in the Peloponnesus, Mount Tay-

getus (7904 feet), branches off from the circle round Arcadia, strikes southwards, and terminates in the promontory of Tænarum (Cape Matapan). The chief rivers in the Peloponnesus are the Eurotas (Basilipotamo), the Alpheus (Ruphia), draining Arcadia and Elis; and the Peneus, draining Elis. The rock most largely developed in the mountains of Greece is limestone, which often assumes the form of the finest marble. Granite occurs in patches. Tertiary formations prevail in the northeast of the Peloponnesus; and in the northwest, along the shores of Elis, are considerable tracts of alluvium. Silver, lead, zinc, and copper are found and worked to some extent, the famous ancient silver mines of Laurium in Attica still yielding some silver.

Climate.—The climate is generally mild, in the parts exposed to the sea equable and genial, but in the mountainous regions of the interior sometimes very cold. None of the mountains attain the limit of perpetual snow; but several retain it far into the summer. In general the first snow falls in October and the last in April. During summer rain scarcely ever falls, and the channels of the minor streams become dry. Towards the end of harvest rain becomes frequent and copious; and intermittent fevers, etc., become common. In ancient times, when the country was more thickly peopled and better cultivated, the climate seems to have been better.

Vegetation, Agriculture, etc.—Greece is mainly an agricultural country, though agriculture is in a somewhat backward state. The land is largely held by peasant proprietors. The principal crops are wheat, barley, and maize. The cultivated land produces all the fruits of the latitude—figs, almonds, dates, oranges, citrons, melons, etc. The vine also grows vigorously, as it did in ancient Greece. But a much more important product of Greece, especially on the coasts of the Peloponnesus, and in the islands of Cephalonia, Zante, Ithaca, and Santa Maura, is the Corinthian grape or currant. The olive is also largely grown (as in ancient times), and the culture of the mulberry, for the rearing of silkworms, has recently been greatly extended. The extensive forests contain among other trees a peculiar kind of oak (*Quercus Ægilops*), which yields the valonia of commerce. The domestic animals are neither numerous nor of good breeds. Asses are almost the only beasts of burden employed; and dairy produce is obtained from the sheep and the goat.

Manufactures, Trade, Communications, etc.—The manufactures are extremely limited, but, with all other branches of industry in Greece, are increasing. They include cottons, woolens, earthenware, leather, etc., and shipbuilding is carried on largely at various points of the coast, and at the Piræus. A large part of the shipping of Greece is engaged in the carrying trade between Britain, Germany, etc., and Greece, Turkey, and other Mediterranean countries. The chief ports are Corfu, Syra, Piræus (the port of Athens), and Patras. The principal exports are currants and olive oil; but valonia, emery, silk, dried figs, raisins, honey, wax, lead, tobacco, and other articles are also exported; the principal imports are cereals, and cotton, woolen, and silk goods, sugar, iron goods, coffee, etc. The greatest hindrance to the development of Greece at the present time is the want of good roads, but this is being gradually remedied. The mountainous character of the country greatly restricts railroad building and only a few hundred miles are in operation. The money unit of Greece is the *drachma* of 100 *lepta*, which is nominally 1 franc.

Constitution, etc.—According to the present constitution, the throne is hereditary in the family of King George (second son of the late King of Denmark). The legislative authority is vested in a single chamber, called the Boulē, the members of which (proportioned in number to the amount of the population) are elected for four years by ballot by manhood suffrage. The executive power rests with the king and ministry. The Greek Church alone is established, but all forms of religion enjoy toleration. Justice is administered, on the basis of the French civil code, by a supreme court (*Areios Pagos*), at Athens; four royal courts (*Ephiteia*), at Athens, Nauplia, Patras, and Corfu; sixteen courts of primary resort (*Protodokeia*), one in each principal town. The public revenue, derived chiefly from customs, land tax, tobacco and petroleum monopoly, state domains and national property, etc., was estimated for 1910 at $29,750,000; the expenditure $29,210,000. Greece has a large debt, the total for 1910 being about $170,000,000. All able-bodied males are liable to military service during a term of nineteen years, of which in the infantry one year and in special corps two years must be spent with the colors, the remainder in the reserve and in the landwehr or militia. In 1910 the total nominal strength of the army was 50,000. The navy consisted of three small ironclads, and a number of gunboats and torpedo boats.

People.—The ancient Greeks were an Aryan race, probably most closely akin to

Greece

the Italian peoples. They were noted for physical beauty and intellectual gifts. The present population contains a considerable intermixture of foreign stocks, among which the Albanese, or Arnauts, are the most numerous; but the great majority, though not without some taint in their blood, are of Greek extraction. While the population of Greece proper, at the last census, was as above given, the whole Greek nationality reaches nearly 8,000,000, of whom 3,500,000 are found in European Turkey and 2,000,000 in Asia Minor. Education in Greece is free and compulsory in theory (from the age of five to twelve), but a large proportion of the people can neither read nor write. There are three grades of schools, the primary national schools, the Hellenic or secondary grammar schools, and the gymnasia, which are higher grammar schools or colleges. In addition there is a university at Athens.

The national dress of the Greeks resembles the Albanian costume. For the men it consists of a tight jacket, generally scarlet, wide trousers descending as far as the knee, and embroidered gaiters; for the women it consists of a vest fitting close to the shape, and a gown flowing loosely behind.

History.—The earliest inhabitants of Greece were the Pelasgians, of whom little or nothing is known with certainty. To them are attributed certain remains of ancient buildings, especially the so-called Cyclopean works in the Peloponnesus. The Pelasgians were succeeded by the Hellenes, or Greeks proper, who may have been simply one of the Pelasgian tribes or races. To the early period of the Hellenic occupation of Greece belong the legends of the Trojan War, of Theseus, of Jason and the Argonauts, etc. The Hellenes were divided into four chief tribes—the Æolians, occupying the northern parts of Greece (Thessaly, Bœotia, etc.); the Dorians, occupying originally a small region in the neighborhood of Mount Œta; the Achæans, occupying the greater part of the Peloponnesus; and the Ionians, occupying the northern strip of the Peloponnesus and Attica. Of the four principal tribes the Ionians were most influential in the development of Greece. The distribution of the Hellenic tribes was greatly altered by the Dorian migration, sometimes called 'the return of the Heracleidæ' (descendants of Hercules), placed by Thucydides about eighty years after the fall of Troy, or about B.C. 1104, according to the ordinary but questionable chronology. Before the great migration several smaller ones had taken place, causing considerable disturbance; and at last the hardy Dorian inhabitants of the mountainous region about Mount Œta conquered a large part of Northern Greece, and then entered and subdued the greater part of the Peloponnesus, driving out or subjugating the Achæans, as the Achæans had the Pelasgians. In the legend the Dorians are represented as having entered the Peloponnesus under Temenus, Cresphontes, and Aristodemus, three descendants of Heracles (Hercules), who had come to recover the territory taken from their ancestors by Eurystheus. Of the Achæan inhabitants of the Peloponnesus a large section occupied the territory formerly in possession of the Ionians, henceforward called Achaia. The Ionians driven out of the Peloponnesus found at first a refuge among their kindred in Attica, but owing to its limited territory were soon compelled to leave it and found Ionic colonies on several of the islands of the Ægean Sea and on the middle part of the coast of Asia Minor, where they built twelve cities, later forming an Ionic Confederacy. The principal of these were Ephesus and Miletus. About the same time another body of Greeks, from Thessaly and Bœotia, are said to have founded the Æolian colonies on some of the northern islands of the Ægean, and on the northern part of the western coast of Asia Minor. The Æolic colonies of Asia Minor also formed a confederacy of twelve cities, afterwards reduced to eleven by the accession of Smyrna to the Ionic Confederacy. The southern islands and the southern part of the west coast of Asia Minor were in like manner colonized by Dorian settlers. The six Doric towns in Asia Minor, along with the island of Rhodes, formed a confederacy similar to the Ionic and Æolic ones.

In course of time many Greek settlements were made on the coasts of the Hellespont, the Propontis (Sea of Marmora), and the Black Sea, the most important being Byzantium (Constantinople), Sinope, Cerasus, and Trapezus (Trebizonde). There were also flourishing Greek colonies on the coasts of Thrace and Macedonia; for example, Abdera, Amphipolis, Olynthus, Potidæa, etc.; and the Greek colonies in Lower Italy were so numerous that the inhabitants of the interior spoke Greek, and the whole region received the name of Greater Greece (Magna Græcia). The most famous of the Greek colonies in this quarter were Tarentum, Sybaris, Croton, Cumæ, and Neapolis (Naples). Sicily also came to a great extent into the hands of the Greeks, who founded on it or enlarged many towns, the largest, most powerful

and most highly cultured of the Greek colonies here being the Corinthian colony of Syracuse, founded in the eighth century B. C. Other important colonies were Cyrene on the north coast of Africa, and Massilia (Marseilles) on the south coast of Gaul. All these colonies as a rule preserved the customs and institutions of the mother city, but were quite independent.

Although ancient Greece never formed a single state, the various Greek tribes always looked upon themselves as one people, and classed all other nations as *Barbaroi* (foreigners). There were four chief bonds of union between the Greek tribes. First and chiefly they had a common language, which, despite its dialectic peculiarities, was understood throughout all Hellas or the Greek world. Secondly, they had common religious ideas and institutions, and especially, in the oracle of Delphi, a common religious sanctuary. Thirdly, there was a general assembly of the Greeks, the Amphictyonic League, in which the whole people was represented by tribes (not by states), and the chief functions of which were to guard the interests of the sanctuary of Delphi, and to see that the wars between the separate states of Greece were not too merciless. The fourth bond consisted in the four great national festivals or games, the Olympian, Isthmian, Nemean, and Pythian, on the first of which the whole of Greece based its calendar.

The various separate states of Greece may be divided, according to the form of their constitution, into the two great classes of aristocratic and democratic. Sparta or Lacedæmon, the chief town of Laconia and of the Doric tribe, was the leading aristocratic state; and Athens, the capital of Attica and the chief town of the Ionic tribe, was the leading democratic state; and as a rule all the Doric states, and subsequently all those under the influence of Sparta, resembled that city in their constitution; and all the Ionic states, and those under the influence of Athens, resembled it. These two tribes or races are the only ones that come into prominence during the earlier part of Greek history subsequent to the Doric migration. Sparta is said to have derived its form of government, and all its institutions, in the ninth century B. C., from Lycurgus, whose regulations developed a hardy and warlike spirit among the people, the results of which were seen in their conquests over surrounding states, especially over the Messenians in the eighth and seventh centuries B. C.

The constitution of Athens appears from the legends of Theseus and Codrus to have been at first monarchical, and afterwards aristocratic, and to have first received a more or less democratic character from Solon at the beginning of the sixth century B.C. This was followed about fifty years later by a monarchical usurpation under Pisistratus, and his sons Hippias and Hipparchus, the last survivor of whom, Hippias, reigned in Athens till 510 B.C. After the expulsion of Hippias the republic was restored, under the leadership of Cleisthenes, in a more purely democratic form than at first. A brief struggle with the Spartans, whose aid was invoked by some of the nobles, now took place, and Athens emerged from it well prepared for the new danger which threatened Greece.

The Greek colonies in Asia Minor and the adjacent islands, after being conquered by Crœsus, king of Lydia, fell with the fall of Crœsus into the power of Cyrus, king of Persia. In B. C. 500, however, the Ionians revolted with the assistance of the Athenians and Eretrians, and pillaged and burned Sardis. The rebellion was soon crushed by Darius, who destroyed Miletus, and prepared to invade Greece. In 492 he sent an expedition against the Greeks under his son-in-law Mardonius, but the fleet which carried his army was destroyed in a storm off Mount Athos. A second army, under the command of Datis and Artaphernes, landed on Eubœa, and after destroying Eretria, crossed the Euripus into Attica; but it was totally defeated in B.C. 490 on the plain of Marathon by 10,000 Athenians and 100 Platæans, under Miltiades. In the midst of preparations for a third expedition Darius died, leaving his plans to be carried out by his son Xerxes, who, with an army of 1,700,000 men, crossed the Hellespont in 481 by means of two bridges of boats, and marched through Thrace, Macedonia, and Thessaly, while his fleet followed the line of coast. In the pass of Thermopylæ he was held in check by Leonidas with 300 Spartans and 700 Thespians; but the small band was betrayed and annihilated (480 B.C.); and the way through Phocis and Bœotia being now open he advanced into Attica, and laid Athens in ruins. The deliverance of Greece was chiefly due to the genius and courage of Themistocles. The united fleet of the Greeks had already contended with success against that of the Persians off Artemisium, and had then sailed into the Saronic Gulf, followed by the enemy. Themistocles succeeded in inducing the Persians to attack in the narrow strait between Attica and Salamis, and totally defeated them.

From a neighboring height Xerxes himself witnessed the destruction of his fleet,

and at once began a speedy retreat with his land army through Thessaly, Macedonia, and Thrace, leaving behind him 300,000 men in Thessaly. In the spring of the following year (479) these advanced into Attica and compelled the citizens once more to seek refuge in Salamis; but were so completely defeated at Platæa by the Greeks under Pausanias, that only 40,000 Persians reached the Hellespont. On the same day the remnant of the Persian fleet was defeated by the Greeks off Mount Mycale.

The brilliant part taken by the Athenians under Themistocles in repelling this invasion of Athens greatly increased her influence throughout Greece. From this date begins the period of the leadership or *hegemony* of Athens in Greece, which continued to the close of the Peloponnesian war, 404 B.C. The first thing which Athens exerted her influence to effect was the formation of a confederacy, including the Greek islands and maritime towns, to supply means for the continuance of the war by payments into a common treasury established on the island of Delos, and by furnishing ships. In this way Athens gradually increased her power so much that she was able to render tributary several of the islands and smaller maritime states. In 469 B.C. the series of victories won by the Athenians over the Persians was crowned by the double victory of Cimon over the Persian fleet and army on the Eurymedon, in Asia Minor, followed by the Peace of Cimon, which secured the independence of all Greek towns and islands. Shortly after followed the brilliant administration of Pericles, during which Athens reached the height of her grandeur.

The position of Athens, however, and the arrogance and severity with which she treated the states that came under her power made her many enemies. In the course of time two hostile confederacies were formed in Greece, one consisting of Athens and the democratic states of Greece; the other of Sparta and the aristocratic states. At last, in 431, war was declared by Sparta on the complaint of Corinth that Athens had furnished assistance to Corcyra in its war against the mother city; and on that of Megara, that the Megarean ships and merchandise were excluded from all the ports and markets of Attica; and thus began the Peloponnesian war which for twenty-seven years devastated Greece.

In the first part of the war the Spartans, who invaded Attica in 431 B.C. and three times in the five years following, had considerable successes, which were aided by the pestilence that broke out at Athens and the death of Pericles In 425, however, Pylos was captured by the Athenian general Demosthenes, and the Spartan garrison in the island of Sphacteria was compelled to surrender to Cleon. Soon after Cythera fell into the hands of the Athenians, but they were defeated in Bœotia at Delium (424) and at Amphipolis in Thrace by Brasidas in 422, when both Cleon and Brasidas were killed. The Peace of Nicias (421 B.C.), which followed the death of Cleon, brought disaffection into the Spartan Confederacy, the Corinthians endeavoring with Argos and Elis to wrest from Sparta the hegemony of the Peloponnesus. In this design they were supported by Alcibiades; but Sparta was victorious at the battle of Mantinea in 418. Soon after this the Athenians resumed hostilities, fitting out in 415 B.C. a magnificent army and fleet, under the command of Alcibiades, Nicias, and Lamachus, for the reduction of Syracuse. Alcibiades, however, being subsequently deprived of his command on a charge of impiety, betook himself to Sparta, and exhorted the city to renew the war with Athens. By his advice one Spartan army was despatched to Attica, where it took up such a position as prevented the Athenians from obtaining supplies from Eubœa, while another was sent under Gylippus to assist their kindred in Sicily. These steps were ruinous to Athens. The Athenian army and fleet at Syracuse were completely destroyed, and though the war was maintained with spirit the prestige of Athens was seriously diminished. Many of her allies joined Sparta, and a revolution and brief change of government tended still further to weaken her. Still she made not unsuccessful efforts to regain her position, conquered the revolted towns about the Bosporus, and defeated the Spartan admiral Callicratidas off the islands of Arginusæ in 406. Sparta, however, was now in receipt of Persian aid, and Lysander, having captured nearly the whole Athenian fleet at Ægospotamos (405), retook the towns of Asia Minor, surrounded Athens, and blocked the Piræus. In 404 B.C. the Athenians were starved into surrender, the fortifications were destroyed, and an aristocratic form of government was established by Sparta, in which the supreme power was placed in the hands of thirty individuals, commonly known as the Thirty Tyrants. Only a year later, however (403), Thrasybulus was able to re-establish the democracy.

The period which follows the fall of Athens is that of Sparta's leadership or hegemony in Greece, which lasted till the

battle of Leuctra, in 371 B.C. The Spartan rule was not more liked than that of Athens, and the character of the Spartan state itself, with its increase of wealth and power, underwent great change. To escape the stigma of having ceded the cities of Asiatic Greece to Persia, Agesilaus was sent to retake them, but was defeated by the fleet of Pharnabazus under Conon the Athenian; and the states of Greece, the Spartans included, at last, in 387, agreed to the disgraceful Peace of Antalcidas, by which the whole west coast of Asia Minor was ceded to the Persians. An act of violence committed by a Spartan general in garrisoning Thebes in 380 was the commencement of the downfall of Sparta. The Thebans revolted under Pelopidas and Epaminondas, and the Spartans on invading Bœotia were so completely defeated at Leuctra in 371 B.C. that they never fully recovered from the blow. With this victory Thebes won the leading place in Greece, which she maintained during the lifetime of Epaminondas, whose influence was paramount in the Peloponnesus. Epaminondas fell in defeating the Spartans and Arcadians near Mantinea in 362, and his death reduced once more the authority of Thebes in Greece.

Two years after the death of Epaminondas, Philip, the father of Alexander the Great, became king of Macedonia. An occasion for interference in the affairs of Greece was furnished him by the war known as the Sacred war (355-346), arising from the Phocians having taken possession of some of the land belonging to the sanctuary of Delphi. The Phocians were besieged by the Thebans, who called in the aid of Philip of Macedon, who was accorded the place till then held by the Phocians in the Amphictyonic League. It was not, however, till the Locrian war (339-338) that Philip acquired a firm hold in Greece. The Locrians had committed the same offense as the Phocians, and Philip, as one of the members of the league, received the charge of punishing them. The real designs of Philip soon became apparent, and the Athenians, on the advice of Demosthenes, hastily concluded an alliance with the Thebans, and sent an army to oppose him. The battle of Chæronea which ensued (338) turned out, however, disastrously for the allies, and Philip became master of Greece. He then collected an army for the invasion and conquest of the rotten empire of Persia, and got himself declared commander-in-chief by the Amphictyonic League at Corinth in 337 B.C.; but before he was able to start he was assassinated, B.C. 336.

The design of Philip was taken up and carried out by his son Alexander the Great, during whose absence Antipater was left behind as governor of Macedonia and Greece. Soon after the departure of Alexander, Agis III of Sparta headed a rising against Antipater, but was defeated at Megalopolis in 330 B.C., and no other attempt was made by the Greeks to recover their liberty for nearly a hundred years. At the close of the wars which followed the death of Alexander, and which resulted in the division of his empire, Greece remained with Macedonia.

The last efforts of the Greeks to recover their independence proceeded from the Achæans, who, though frequently mentioned by Homer as taking a prominent part in the Trojan war, had for the most part kept aloof from the quarrels of the other states, and did not even furnish assistance to repel the Persian invasion. They had taken part, though reluctantly, in the Peloponnesian war on the side of Sparta, and had shared in the defeat of Megalopolis in B.C. 330. In the course of the first half of the third century B. C. several of the Achæan towns expelled the Macedonians, and revived an ancient confederacy, which was now known as the Achæan League. Aratus of Sicyon became its leading spirit. It was joined also by Corinth, and even by Athens and Ægina. The Spartans, however, who had maintained their independence against Macedonia, naturally looked with jealousy on the efforts of Aratus, and during the reign of Cleomenes a war broke out between Sparta and the Achæan League. The league was at first worsted, and was only finally successful when Aratus sacrificed the ultimate end of the league by calling in the aid of the Macedonians. In the battle of Sellasia (222 B.C.) Cleomenes was defeated, and the Macedonians became masters of Sparta. Aratus died in 213, and his place was taken by Philopœmen, 'the last of the Greeks,' who succeeded in making the league in some degree independent of Macedonia.

About this time the Romans, who had just come out victorious from a second war with Carthage, found occasion to interfere in the affairs of Greece. Philip V of Macedon having allied himself with Hannibal, the Romans sent over Flaminius to punish him, and in this war with Philip the Romans were joined by the Achæan League. Philip was defeated at Cynocephalæ in 197 B.C., and was obliged to recognize the independence of Greece. The Achæan League thus became supreme in Greece, having been

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joined by all the states of the Peloponnesus. But the league itself was in reality subject to Rome, which found constant ground for interference until 147 B. C., when the league openly resisted the demand of the senate, that Sparta, Corinth, Argos, and other cities, should be separated from it. In the war which ensued, which was concluded in 146 B. C. by the capture of Corinth by the Roman consul Mummius, Greece completely lost its independence, and was subsequently formed into a Roman province.

On the division of the Roman Empire Greece fell of course to the eastern or Byzantine half. From 1204 to 1261 it formed a part of the Latin Empire of the East, and was divided into a number of feudal principalities. In the latter year it was reannexed to the Byzantine Empire, with which it remained till it was conquered by the Turks between 1460 and 1473. In 1699 the Morea was ceded to the Venetians, but was recovered by the Turks in 1715. From 1715 till 1821 the Greeks were without intermission subject to the domination of the Turks. In 1770, and again in 1790, they made vain attempts at insurrection, but in 1821 Ali, the pasha of Janina, revolted against the Sultan Mahmoud II, and secured the aid of the Greeks by promising them their independence. The rising of the Greeks took place on the 6th of March, under Alexander Ypsilanti, and on the 1st of January, 1822, they published a declaration of independence. In the same year Ali was assassinated by the Turks, but the Greeks, encouraged by most of the European nations, continued the struggle under various leaders, of whom the chief were Marcos Bozzaris, Capo d'Istria, Constantine Kanaris, Kolocotroni, etc. In 1825 the Turks, with the aid of Ibrahim Pasha, took Tripolitza, the capital of the Morea, and Missolonghi, and though Lord Cochrane organized the Greek fleet, and the French colonel Fabvier their army, the Turks continued to triumph everywhere. A treaty was then concluded at London (July 6, 1827) between Britain, France, and Russia, for the pacification of Greece, and when the mediation of these three powers was declined by the sultan, their united fleets, under Admiral Codrington, annihilated the Turkish fleet off Navarino, October 20, 1827. In the beginning of the following year (1828) Count Capo d'Istria became president of the state, and later on in the same year Ibrahim Pasha was forced to evacuate Greece. At last, on the 3d of February, 1830, a protocol of the allied powers declared the independence of Greece, which was recognized by the Porte on the 25th of April of that year. The crown was offered to Leopold, prince of Saxe-Coburg, and when he refused it, to Otho, a young prince of Bavaria, who was proclaimed King of the Hellenes at Nauplia in 1832. But his arbitrary measures, and the preponderance which he gave to Germans in the government, made him unpopular, and although after a rebellion in 1843 a constitution was drawn up, he was compelled by another rebellion in 1862 to abdicate. In the following year Prince George, second son of the king of Denmark, was called to the throne and began to reign as George I. In 1864 the Ionian Islands, which had been under British protection, were annexed to Greece. As a result of the Berlin Congress of 1878 Thessaly and part of Epirus were ceded to Greece. The union of Eastern Roumelia with Bulgaria in 1885 gave rise to a demand for rectification of frontiers, and war with Turkey was only prevented by the great powers, which enforced the reduction of the Greek army to a peace footing. Greece demanded the cession of Crete, and war with Turkey broke out in 1897. The result was disastrous, Turkey pouring troops into Thessaly and utterly defeating the Greek troops. Many reforms, originating with Venizelos, the eminent Cretan, were undertaken. In 1913, as a result of the Balkan wars, Greece gained additional territory, including Salonika and other sections of Macedonia, the Ægean Islands, Epirus, etc., giving Greece a total area of 42,933 square miles and a population (1914) of 4,821,300. George I was killed by an anarchist in 1913 and was succeeded by his son Constantine, who refused to join the Allies against Germany and Austria in the European war. He was deposed in 1917 and was succeeded by Alexander, his second son. Venizelos again became premier and his pro-Ally policy was rewarded by a great extension of territory through the treaty with Turkey (1920), Greece obtaining all that was left of Turkey-in-Europe with the exception of Constantinople and district. Western Thrace was ceded by Bulgaria.

King Alexander died in October, 1920, and a remarkable political upset occurred in November, when Premier Venizelos was overwhelmingly defeated in the elections. By vote of the people Constantine was recalled to the throne. He returned to Athens December 19, 1920, and was greeted enthusiastically by the populace. The revision of the Turkish treaty, in March, 1921, did not meet with the approval of the Greeks and they began a new campaign in Asia Minor.

Religion of Ancient Greece.—The religion of the ancient Greeks was polytheism, there being a great number of

divinities, many of whom must be regarded as personifications of natural powers, or of phenomena of the external world, personified sentiments, etc. Thus there were gods corresponding to Earth and Heaven, the Ocean, Night, etc. The Romans, when they became acquainted with the literature and religion of the Greeks, identified the Greek deities with those of their own pantheon. In this way the Greek and Roman deities came to be confounded together, and the names of the latter even came to supersede those of the former. The supreme ruler among the gods was Zeus (Roman Jupiter or Juppiter), the son of Kronos (Roman Saturn), who after the subjugation of the Titans and Giants ruled in Olympus, while his brother Pluto reigned over the lower world (Hades, Tartarus), and Poseidōn (Neptune) ruled in the sea. Like reverence was paid to Hēra (Juno), the sister and wife of Zeus, and the queen of Heaven; to the virgin Pallas Athēnē (Minerva); to the two children of Lētō (Latona), namely, Apollo, the leader of the Muses, and his sister the huntress Artĕmis (Diana), the goddess of the moon; to the beautiful daughter of Zeus, Aphrodītē (Venus), the goddess of love; to Arēs (Mars), the god of war, Hermēs (Mercury), the herald of the gods, and others besides. In addition to these there was an innumerable host of inferior deities (Nymphs, Nereids, Tritons, Sirens, Dryads and Hamadryads, etc.) who presided over woods and mountains, fields and meadows, rivers and lakes, the seasons, etc. There was also a race of heroes or demigods (such as Heracles or Hercules, Perseus, etc.) tracing their origin from Zeus, and forming a connecting link between gods and men, while on the other hand the Satyrs formed a connecting link between the race of men and the lower animals. The true teachers of the Greek religion were the poets and other writers, and it is to the hymns, epics, dramas, and histories of the Greeks that we must turn in order to learn how they regarded the gods. No degree of consistency is to be found in them, however, the personality and local origin of the writers largely moulding their views. A belief in the justice of the gods as manifested in the punishment of all offences against them was cardinal. The man himself might escape, but his children would suffer, or he might be punished in a future state—the latter view being less commonly held than the former of an entailed curse. The gods are also represented by the Greeks as holy and truthful, although they are in innumerable other passages described as themselves guilty of the grossest vices, and likewise as prompting men to sin, and deceiving them to their own destruction. In their general attitude towards men the gods appear as inspired by a feeling of envy or jealousy. Hence they had constantly to be appeased, and their favor won by sacrifices and offerings. Certain classes were, however, under the peculiar protection and favor of the gods, especially strangers and suppliants. The Greeks believed that the gods communicated their will to men in various ways, but above all, by means of oracles, the chief of which were that of Apollo at Delphi, and that of Zeus at Dodona. Dreams ranked next in importance to oracles, and divination by birds, remarkable natural phenomena, sneezing, etc., was practised. The Greeks appear to have had at all times some belief in a future existence, but in the earliest times this belief was far from being clearly defined.

Greece, Language of.—The Greek language belongs to the Indo-European group, and is thus a sister of the Sanskrit, Latin, Teutonic, and Celtic tongues. It is customary to distinguish three leading dialects according to the three leading branches of the Greeks, the Æolic, the Doric, and the Ionic, to which was afterwards added the mixed Attic dialect; besides these there are several secondary dialects. Akin to the Ionic is the so-called Epic dialect, that in which the poems of Homer and Hesiod are written, and which was afterwards adopted by other Epic writers. The Doric was hard and harsh; the Ionic was the softest. The Æolic was spoken on the north of the Isthmus of Corinth (except in Megara, Attica, and Doris), in the Æolian colonies of Asia Minor, and on some of the northern islands of the Ægean Sea. The Doric was spoken in the Peloponnesus, in Doris, in the Doric colonies of Asia Minor, of Lower Italy (Tarentum), of Sicily (Syracuse, Agrigentum); the Ionic in the Ionian colonies of Asia Minor, and on the islands of the Archipelago; and the Attic in Attica. In each of these dialects there are celebrated authors. The Ionian dialect is found pure in Herodotus and Hippocrates. The Doric is used in the poems of Pindar, Theocritus, Bion, and Moschus. In Æolic we have fragments of Alcæus and Sappho. After Athens had obtained the supremacy of Greece, and rendered itself the center of all literary cultivation, the masterpieces of Æschylus, Sophocles, Euripides, Aristophanes, Thucydides, Xenophon, Plato, Aristotle, Isocrates, Demosthenes, etc., made the

Attic the common dialect of literature. Grammarians afterwards distinguished the genuine Attic, as it exists in those masters, from the Attic of common life, calling the latter the *common Greek* or *Hellenic* dialect. In this latter dialect wrote Theophrastus, Apollodorus, Polybius, Plutarch, and others. Many later writers, however, wrote genuine Attic, as Lucian, Ælian, and Arrian. Except the dramatists, the poets by no means confined themselves to the Attic; the dramatists themselves assumed the Doric, to a certain degree, in their choruses, and the other poets retained the Homeric style, which was a congeries of forms occurring as peculiarities in the various dialects.

At what time this language first began to be expressed in writing has long been a subject of doubt. According to the usual account Cadmus the Phœnician introduced the alphabet into Greece; and it is an undoubted fact that the most of the Greek letters are derived from the Phœnician ones. The Greek alphabet possesses the following twenty-four letters:

Α, α (alpha), *a*; Β, β (beta), *b*; Γ, γ (gamma), *g*; Δ, δ (delta), *d*; Ε, ε (epsilon), *ĕ*; Ζ, ζ (zeta), *z*; Η, η (eta), *ē*; Θ, θ, ϑ (theta), *th*; Ι, ι (iota), *i*; Κ, κ (kappa), *k*; Λ, λ (lambda), *l*; Μ, μ (mu), *m*; Ν, ν (nu), *n*; Ξ, ξ (xi), *x*; Ο, ο (omicron, i.e. small o), *ŏ*; Π, π (pi), *p*; Ρ, ρ (rho), *r*; Σ, σ, ς (sigma), *s*; Τ, τ (tau), *t*; Υ, υ (upsilon), *u*, commonly transliterated by *y*; Φ, φ (phi), *ph*; Χ, χ (chi), *ch* guttural (as in Scotch *loch*); Ψ, ψ (psi), *ps*; Ω, ω (omega, or great o), *ō*. The alphabet originally introduced into Greece is said to have consisted of but sixteen letters: Θ Ξ Φ Χ Ζ Η Ψ Ω being of later introduction.

Modern Greek, as spoken by the uneducated classes, is called Romaic, from the fact that those who speak it considered themselves before the descent of the Turks upon Europe as belonging to the Roman Empire, and hence called themselves *Romaioi*, or Romans. The Greek of the educated classes, that used in the newspapers and other literature of the present day, is distinguished from it by a greater resemblance to the Greek of antiquity, which renders it easy for any one who has a satisfactory acquaintance with ancient Greek to read the modern literary Greek. Besides the foreign words introduced into modern Greek, many words have changed their original signification. The grammar has also undergone considerable modification. For example, the numbers have been reduced to two by the suppression of the dual; and the cases to four by the disappearance of the dative, which is now expressed by a preposition with the accusative. The first cardinal numeral is now used as an indefinite article. The degrees of comparison are sometimes expressed by the use of *pleon* (more). The past and future tenses are formed by the aid of the verbs *echō* (I have), and *thelō* (I will). The infinitive mood has its place supplied by a periphrasis with the verb in the subjunctive, and the middle voice has disappeared. The ancient orthography is still preserved, but the vowels *η*, *ι*, and *υ*, and the diphthongs *ει*, *οι*, *υι*, are all pronounced like *ee* in English *seen*; *β* is now pronounced as *v*, and the sound of *b* is expressed by *μπ*; *Δ* is pronounced like *th* in *thus*, and *θ* like *th* in *think*.

Greece, Literature of.—The commencement of extant Greek literature is to be found in the two epic poems attributed to Homer, the *Iliad* and the *Odyssey*, which it is commonly believed took shape on the Ionian coast or its islands somewhere between 950 and 850 B.C., and came thence to Greece proper (but see *Homer*). The former deals directly with the Trojan war, the latter describes the wanderings of Ulysses in returning from it. Another poem, of a humorous character, the *Batrachomyomachia*, or 'Battle of the Frogs and Mice,' one of the first and best of parodies, was also ascribed to Homer, but on altogether insufficient grounds, being of comparatively recent origin. In European Greece there appeared about the middle of the ninth century, at Ascra in Bœotia, the poet Hesiod, who stood at the head of another epic school. Of the sixteen works attributed to him there have come down to us the *Theogony* or *Origin of the Gods*, the *Shield of Heracles* (a fragment of a larger poem of later authorship), and, most important of all, the *Works and Days*, a didactic work on agriculture. The works of Homer and Hesiod constituted in a certain degree the foundation of youthful education among the Greeks. The Homeric and Hesiodic schools begin to meet in the Homeric hymns composed by different hands between 750 and 500 B.C. Next came the period of Elegiac and Iambic poetry (700-480), both Ionian, in which the poet's own feelings and personality became distinctly manifested, the chief names being those of Callinus of Ephesus (flourished about 690 B.C.), Tyrtæus, originally of Attica (675), Archilochus of Paros (670), Simonides of Amorgos (660), Mimnermus of Smyrna (620), Solon of Athens (594), Theognis of Megara (540), Pho-

cylides of Miletus (540), Xenophanes of Colophon (510), Hipponax of Ephesus (540), Simonides of Ceos (480). Greek lyric poetry was inseparably linked with music, the lyric period proper lasting from about 670 to 440 B.C. Two principal schools may be distinguished, the Æolian and the Dorian. To the former belong Alcæus (611-580), Sappho (610), and Anacreon (530), though the works which now bear Anacreon's name are spurious. To the Dorian school belong Alcman of Sparta (660 B.C.), credited with the invention of the strophe and antistrophe, Stesichorus (Tisias) of Himera (620), who added to these the epode, Arion (600), who gave shape to the dithyramb, and Ibycus of Rhegium (540). Simonides of Ceos (480) was even more famous as lyric poet than as elegist, his lyrics marking the commencement of a school of national lyric poetry. His nephew, Bacchylides, was also famous, but the chief was undoubtedly Pindar (522-443). About this time began a new literary development, that of the drama, the earliest names in which are Thespis (536) and Phrynichus (512-476). The performance at first, however, was merely a sort of oratorio or choral entertainment, until Æschylus (525-456) introduced a second actor, and subordinated choral song to dialogue. A third and even a fourth actor was added by Sophocles (495-405 B.C.), who supplemented the heroic tragedy of Æschylus with the tragedy of human character and the fundamental passions. Euripides (480-406) brought new qualities of picturesqueness, homeliness, and pathos with a less rigid artistic method, and formed a fitting third in the great tragic triad. With this rapid growth of tragedy there was a corresponding development of comedy which assumed an artistic form about 470 B.C. The names of Cratinus (448) and Eupolis (430) are overshadowed by that of Aristophanes (448-385), who for nearly forty years was the burlesque commentator upon the life of the period. Aristophanes may be regarded as closing the period of the old comedy; the middle comedy of from 390 to 320 (Antiphanes, Alexis, and others) was transitional from the great political comedy to the new comedy of manners, which was vigorous from 320 to 250 in the hands of Menander, Philemon, and Diphilus.

In the meantime a prose literature had arisen, commencing with the group of early Ionian writers (550-450), of which Pherecydes of Syros, Anaximenes, and Anaximander, philosophers, and the logographer or compiler Hecatæus of Miletus were chief. Hellanicus of Mitylene (450) was one of the earliest critical historians, but Herodotus (484-428) was the first writer of great historic rank, as he was also the first great prose stylist. Thucydides (471-400?) was the founder of philosophic history, and Xenophon (431-354), who has left excellent historic narratives, was also the earliest Greek essayist. The oldest piece of Attic prose is the essay on Athenian polity wrongly assigned to Xenophon. Other writers in history were Ctesias (415-398), Philistus (363), Theopompus (352), and Ephorus (340). From 360 onwards Attic history and archæology were preserved in works by various writers, of whom Philochorus (306-260) was chief. The study which oratory and rhetoric received in Athens was an important factor in shaping Attic prose, the chief orators being Antiphon (480-411), Andocides (415-390), Lysias (403-381), Isocrates (436-338), Isæus (390-353), and above all, Demosthenes (384-322) with his contemporaries, Æschines, Lycurgus, and others, and Demetrius of Phalerum (318) who ushered in the decline of oratory. Philosophy shared the development of history and oratory, reaching a rare elevation in Plato (429-347), a rare comprehensiveness in Aristotle (384-322), the founders of the academic and peripatetic schools. Minor Socratic schools were the Cyrenaic, founded by Aristippus (370), the Megaric, founded by Euclid (399), and the Cynic, founded by Antisthenes. In the earlier part of the third century the rival schools of Epicurus (342-270) and of Zeno (344-260) became prominent.

From about the year 300 B.C. the literary decadence may be held to date; the period 300 to 146 being known as the Alexandrian. It comprises the learned poetry of Callimachus (who flourished at Alexandria (250 B.C.) and of Lycophron (260), the epic of Apollonius Rhodius (194), the didactic poetry of Aratus (270), and Nicander (150), the pastoral poetry of Theocritus, Bion, and Moschus, the satirical Silloi of Timon (280), the philology and criticism of Zenodotus (280), Aristophanes of Byzantium (200), Aristarchus (156), and Apollodorus (140), the version of the Septuagint, and the scientific works of Eucleides (300), Archimedes and Eratosthenes (240). From 146 B.C. dates the Græco-Roman period in Greek literature, to which belong the historians Polybius (145 B.C.), Diodorus Siculus (40 B.C.), Dionysius of Halicarnassus (25 B.C.), Josephus, Arrian (100 A.D.), Appian (140 A.D.), and Herodian (240 A.D.), the biographies of Plutarch (90

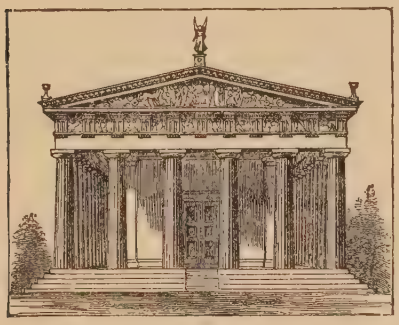
A.D)., of Diogenes Laertius and of Flavius Philostratus (235 A.D.), the geographies of Strabo (18 A.D.), and of Pausanias (160 A.D.), the astronomy and geography of Ptolemy, the informatory works of Athenæus (190), Ælian (220), and Stobæus (480), the rhetorical and belles-lettristic works of Hermogenes (170), Apthonius and Cassius Longinus (260), the medical works of Galen (160), the satirical works of Lucian (160) and of Julian (331-363), the development of the Greek romance, best represented in Heliodorus (390), Achilles Tatius, and Chariton, etc. During this period philosophy is in the main divided between Stoicism and Neoplatonism, the former represented by Epictetus (90 A.D.) and Marcus Aurelius (170), the latter by Plotinus (240), Porphyry, and Iamblichus. The school of Athens had for chief exponent the eclectic Proclus (450). In verse the best names were the fabulist Babrius (40), Oppian (180), Nonnus, Quintus Smyrnæus (400-450), and Musæus (500). The special feature of the later Græco-Roman period was the rise of a Christian Greek literature represented by the patristic epistles, homilies, etc., and ecclesiastical histories, such as those of Eusebius, Socrates, and Sozomen. Among the chief writers were Justin Martyr, Origen, and Clement of Alexandria, Eusebius, Gregory of Nazianzus, Basil, Gregory of Nyssa, Chrysostom, etc. After 529 and until 1453 came the Byzantine period, of which the most important section was from about 850 to 1200. It was characterized by such writers as Eustathius, Photius, and Suidas, mainly occupied in the attempt to reduce to system a large ill-ordered and aimless erudition.

On the fall of Constantinople in 1453 the cultivated classes who still retained the pure Greek either perished or took to flight, or adopted the language of the conquerors. The popular Greek, however, survived, and despite its vulgarization and the modification of its grammatical forms and syntax, it cannot be said that Greek has been a dead language at any period since Homer. By some modern Greek literature is dated from Theodore Prodromos (1143-80), a monk and writer of popular verse, but the only names of importance until the close of the eighteenth century are those of Maximus Margunius (1530-87), Anacreontic poet and letter writer, Leo Allatius (1586-1669), Sciote, scholar and poet, George Chortakes (seventeenth century), Cretan poet, Franciscus Scuphos, Cretan writer on rhetoric (1681), Elias Meniates (1669-1714), a Cephalonian ecclesiastic, Vincentius Kornaros, Cretan poet, author of *Erotocritos* (1756), Kosmas, the Ætolian (1714-79), preacher and founder of schools, Rhegas Pherraios (latter half of eighteenth century), patriotic poet, Eugenios Bulgaris (1716-1806), writer of scientific and religious works, and Nicephorus Theotokes (1736-1800), writer on metaphysics and theology. At this period the patriotic movement found one outlet in the purification of the language and the development of a new literary impulse. The most important figure was that of Adamantros Koraes, or Coray, (1748-1833), who did more than all his predecessors to found a literature. Anthimos Gazes (1764-1837) and Athanasius Christopulos (1772-1847) were eminent as grammarians and lexicographers, the latter also as a lyric poet. Neophytus Bambas (1770-1855), miscellaneous educational writer, Constantine Æconomos (1780-1857), theological writer, Theoclytus Pharmakides (1784-1862), ecclesiastic and journalist, Spiridion Zampelios, literary antiquary, and Trikoupis, orator of the struggle for independence, were also prominent. The poetry of the people is represented chiefly in the songs of the Klephts and other songs dating from the war of independence. At this period the war-songs of Rhigas were sung by the whole nation, and at a later period the two Soutzos, Panagios and Alexander, Calvos, Solomos, and others, earned distinction in the same kind of poetry. The Soutzos were further distinguished as satirists, and Alexander ranks also with the dramatists Rhisos Neroulos and Zampelios. Among the most gifted of recent writers is Rhisos Rangabé, distinguished in lyric, dramatic, and epic poetry, also as a novelist and a scholar.

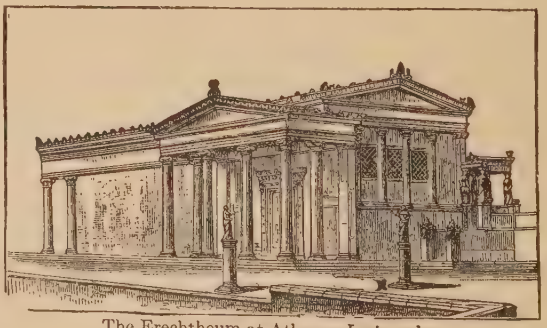
Greece, Art of.—As in literature so in art the Greeks attained the highest pitch of excellence, and in architecture and sculpture furnished models for the rest of the world. In no other race has the artistic spirit been so generally diffused throughout the people, expressing itself in the minor arts of life, in the practical application of ornament in the forms of domestic furniture, pottery, metal work, mosaics, and the like, not less perfectly than in the master-works of architecture and sculpture.

The earliest architectural remains in Greece are pre-Hellenic in origin and Asiatic in character, Greek architecture proper dating from about the close of the eighth century B. C. The earliest known example—the Doric temple at Corinth—belongs to about the middle of the seventh century B. C., and points to

an Egyptian origin, the style being remotely derived from the so-called 'proto-Doric' temple of Beni Hassan in Lower Egypt. Throughout the history of the art it is the public buildings, more particularly the temples, in which the genius of the Greeks displayed itself. The private houses remained simple and even rude in appearance, rarely rising above a single story, and having no external decoration. The temples were for the most part rectangular, though the circular form sometimes occurs in the later periods of Greek art. In the simplest form of the rectangular temple (the *apteral*) there were no columns; but, by an easy development from this, the side walls were carried out beyond those constituting the ends of the building, so as to form a porch. The extended walls terminated in pilasters (*antæ*) between which, in the front line of the porch, two columns were placed. As a further development, four additional columns were placed in advance of the line connecting the *antæ*, sometimes in front only (prostyle), sometimes at both ends (amphiprostyle). More complex forms were known as *peripteral*, where the columns were carried completely round the building; as *dipteral*, where a double range of columns surrounded it; and as *pseudo-dipteral*, where a double range of columns was placed in front and rear, but only a single range at the sides. The dipteral and pseudo-dipteral styles were seldom employed, the chief example of the dipteral having been the temple of Diana at Ephesus, built by Ctesiphon in the sixth century B. C. Most of the famous temples in Greece were, however, peripteral. Three orders are distinguished in Greek architecture according to the treatment of the pillars and of the entablature—the Doric, Ionic, and Corinthian (which see). Of these the Doric is the most ancient, the most important examples in Greece, besides that already mentioned, being the temple at Ægina (middle of the sixth century B. C.), the temple of Theseus at Athens, and the Parthenon, constructed about 448 B.C. by the architects Ictinus and Callicrates, and adorned with unsurpassed sculpture by Phidias and his pupils. Next to these came the temple of Zeus at Olympia, the temple of Apollo at Bassæ, the frieze of which is in the British Museum, the temple of Minerva at Sunium, the great temple at Rhamnus, and those at Selinus in Sicily (middle of seventh century), Agrigentum, Segesta, and Pæstum. The oldest Ionic temple in Greece was probably the temple of Ilissus (about 488 B. C.), but the oldest of which remains are still visible is that dedicated to Juno at Samos, and there are remains of a fine temple of this order at Teos. The most perfect example, however, is the Erechtheum at Athens. The Corinthian order, though Grecian in its origin, is represented amongst the Greek temples by a single example only, that of the Zeus Olympius at Athens; and even this temple belongs to the Roman period. The Choragic monument of Lysicrates at Athens also belongs to this order. The beauty of the Greek buildings was heightened in respect of form by a deviation from ordinary rectilinear construction, in the systematic substitution of delicately-curved lines for straight lines in the columns and steps of their temples, and wherever the illusion attending the sight of straight lines in



Temple of Zeus at Olympia—Doric order.



The Erechtheum at Athens—Ionic order.

perspective was likely to prove an element of weakness. Color and gilding also played an important part in the total effect, the old tufa temples being colored throughout, and even in the marble temples, though it is doubtful if the marble columns were ever colored, the mouldings of cornices and ceilings, the capitals of the antæ, the mouldings of the pediment and the triglyphs were all decorated with color. The colonnades and porticoes, which were usually built round market-places and along quays in seaport towns, were similar in style to the temples. See also *Architecture*.

Greek *sculpture* has been divided into five principal periods, namely: 1. The Dædalian or Early (-580 B.C.). 2. The Æginetan or Archaic (580-480 B.C.). 3. The Phidian or Grand (480-400 B.C.). 4. The Praxitelean or Beautiful (400-250 B.C.). 5. The Decline (250 B.C. onwards). The age of Dædalus marks an advance from an earlier primitive sculpture in which blocks of wood and stone were rudely fashioned into the semblance of life, the imperfections of the art being concealed by real hair and adventitious draperies. During the Dædalian period the treatment was highly conventionalized, a single type serving for a variety of divinities and heroes, the hair being often entirely curled and gathered into a club behind, and the dresses of the female divinities being divided into a few perpendicular folds. Many of these characteristics survived in the Æginetan period, but a higher knowledge of anatomy and greater freedom and boldness of treatment are apparent. The sculptures of the Theseum form a connecting link between the Æginetan school and that of Phidias. To Phidias, besides his statues of Athena and Zeus, were due the designs for the sculptures of the Parthenon, the actual work of these, however, being probably done by his pupils Alcamenes, Agoracritus, and other artists of his time. To this age belonged the sculptor and architect Polycletus (about 452-412 B.C.), whose statue of a youth holding a spear obtained the name of The Canon, as being a standard of form. About the same time the Bœotian sculptor Myron flourished, the famous Discobolus being a reproduction in marble of one of his bronzes. The Praxitelean period is characterized by greater grace and elegance in choice of subject and treatment, together with more of the sensual element making for ultimate decline. Praxiteles excelled in female figures, his Aphrodite at Cnidus in Caria being his most famous work. His rival, Scopas of Paros, was employed on the bas-reliefs of the Mausoleum at Halicarnassus, and was the sculptor of the famous group representing the destruction of the children of Niobe. In Lysippus of Sicyon, in the time of Alexander the Great, the Praxitelean school found its last great figure prior to the decline of the art.

Painting in Greece is said to have had its origin in Sicyon, and to have existed as mere outline and monochrome until Cimon of Cleonæ introduced variety in coloring, foreshortening, and a less rigid art. The Greek artists worked in wax or resin or in water-color, brought to the required consistency by mixing with gum, glue or white of egg; and they painted upon wood, clay, plaster, stone, parchment, and canvas. Until a late period, however, they rarely painted upon walls, usually painting upon panels or tablets to be encased in walls. The earlier masters appear to have used only four colors—red, yellow, white, and black, but by the time of Apelles and Protogenes many other pigments were in use. The earliest painters of renown were Micon of Athens (about 460 B.C.), and Polygnotus of Thasos and of Athens (about 463-430 B.C.); but a higher degree of illusion and realism appears to have been reached under Zeuxis and his rival Parrhasius, towards the close of the fifth century B. C. A greater name than any of these is that of Apelles, the friend of Alexander the Great, contemporaneously with whom flourished Protogenes of Caria, painter and statuary, and Nicias of Athens, a distinguished encaustic painter. Of the work of these artists only a general conception can be formed from the mosaics and frescoes of Pompeii.

Greek Church, or Holy Oriental Orthodox Apostolic Church, that section of the Christian church dominant in Eastern Europe and Western Asia, especially in Turkey, Greece, Russia, and some parts of Austria. In the first ages of Christianity numerous churches were founded by the apostles and their successors in Greek-speaking countries; in Greece itself, in Syria, Egypt, Mesopotamia, Asia Minor, Thrace, and Macedonia. These were subsequently called Greek, in contradistinction to the churches in which the Latin tongue prevailed. The removal of the seat of empire by Constantine to Constantinople, and the subsequent separation of the eastern and western empires afforded the opportunity for diversities of language, modes of thinking, and customs to manifest themselves, and added political causes to the grounds of separa-

tion. During the earliest period the chief seats of influence in the Eastern Church were Jerusalem, Antioch, and Alexandria, the seat of that mystical philosophy, by which the oriental church was distinguished. In 341, soon after the synod of Antioch, the rivalry between the Bishop of Rome and the Bishop of Constantinople began to assume importance, and before 400 differences of doctrine with respect to the procession of the Holy Spirit appeared. The council of Chalcedon in 451 accorded to the eastern bishop the same honors and privileges in his own diocese as those of the Bishop of Rome, and in 484 each bishop excommunicated the other. The title of *Œcumenical Patriarch* was assumed by John, Bishop of Constantinople, in 588, and in the following year the phrase 'Filioque' ('and the Son') was added by the Latins to the Nicene creed (which now reads 'proceeding from the father and the son'), an addition to which the Greek Church was opposed. In 648 Pope Theodore deposed Patriarch Paul II; but a reconciliation of the churches was effected at the Council of Rome (680). The doctrines of the Greek Church were defined by John Damascenus in 730. The disruption was hastened by the banishment of Ignatius by Michael the Drunken and the consecration of Photius (858). The Pope Nicholas I and Photius excommunicated each other in 867. The schism was temporarily healed after the death of Photius, but Michael Cerularius reopened it by charging the Latins with heterodoxy. He was excommunicated by Leo IX in 1054, and in turn excommunicated the pope in the same year, since which the Greeks have been severed from the Roman communion, though the Russo-Greek Church was not separated until the twelfth century. The presence of the Crusaders in the East aggravated the quarrel; Latin patriarchates were established in Antioch and Jerusalem, and, though on the capture of Constantinople by the Crusaders a Latin patriarchate was set up there (1204), the schism was revived there as soon as the Latin empire fell (1262). Reunion was proposed in 1273 by Patriarch Joseph, and effected, with the acknowledgment of the pope as primate, at the council of Lyons (1274). The union, however, was annulled in 1282 by Emperor Andronicus II, and in 1283 and 1285 by synods of Constantinople. It was again effected under John Palæologus at Florence in 1439, but was repudiated in 1443 by the Patriarchs of Alexandria, Antioch, and Jerusalem. In 1453, when the patriarch fled from the Turks, a schismatic Gregory Scholarius was chosen in his place. In 1575 unsuccessful negotiations were commenced with a view to union with the Lutherans, and in 1723 the English bishops even proposed that the Greek and Anglican churches should unite, a proposal revived by the Archbishop of Moscow in 1866. The claims of the czar in 1853 to the protectorate of the Greek churches in Turkey was one of the causes of the Crimean war.

The Greek Church is the only church which holds that the Holy Ghost proceeds from the Father only; the Catholic and Protestant churches deriving the Holy Ghost from the Father and the Son. Like the Roman Church, it has seven sacraments—baptism; chrism; the eucharist, preceded by confession; penance; ordination; marriage; and extreme unction. But it is peculiar—1, in believing in baptism by immersion, the chrism (confirmation) being united with it; 2, in adopting, as to the eucharist, the doctrine of transubstantiation, as well as the Roman views of the host; but in ordering the bread to be leavened, the wine to be mixed with water, and both elements to be distributed to every one, even to children, the communicant receiving the bread broken in a spoon filled with the consecrated wine; 3, the clergy are permitted to marry, but only once and to a virgin; widowed clergy are not permitted to retain their livings, but go into a cloister, where they are called *hieromonachi*. Rarely is a widowed bishop allowed to preserve his diocese. The Greek Church grants divorces, but does not allow the laity a fourth marriage. It differs from the Roman Church in anointing with the holy oil, not only the dying but the sick, for the restoration of health, forgiveness, and sanctification. It rejects the doctrine of purgatory, works of supererogation, indulgences, and dispensations, but admits prayers for the dead, whose condition appears to be considered undetermined until the final judgment. It recognizes no visible vicar of Christ on earth, but the spiritual authority of patriarch is little inferior to that of the pope. It allows no carved, sculptured, or molten image of holy persons or subjects; but the representations of Christ, of Mary, and the saints, must be merely painted, and at most inlaid with precious stones. In the Russian churches, however, works of sculpture are found on the altars. In the invocation of the saints, and especially of the Virgin, the Greeks are as zealous as the Romans. They also hold relics, graves, and crosses sacred; and crossing in the name of Jesus they con-

sider as having a wonderful and blessed influence. Among the means of penance, fasts are particularly numerous with them. They fast Wednesday and Friday of every week, and besides observe four great annual fasts, namely, forty days before Easter; from Whitsuntide to the days of St. Peter and Paul; the fast of the virgin Mary, from the 1st to the 15th of August; and the apostle Philip's fast, from the 15th to the 26th of November; besides the day of the beheading of John the Baptist, and of the elevation of the cross. The calendar of the Greek Church is in the old style, their new year's day falling on Jan. 13th.

The services of the Greek Church consist almost entirely in outward forms. Preaching and catechizing constitute the least part of it. Instrumental music is excluded altogether. The mass is considered of the first importance. The convents conform, for the most part, to the strict rule of St. Basil. The Greek abbot is termed *higumenos*, the abbess *higumenē*. The abbot of a Greek convent which has several others under its inspection is termed *archimandrite*, and ranks next a bishop. The lower clergy in the Greek Church consist of readers, singers, deacons, etc., and of priests or popes and protopopes or archpriests, who are the first clergy in the cathedrals and metropolitan churches. The members of the lower clergy can rise no higher than protopopes, for the bishops are chosen from among the monks, and from the bishops are selected the archbishops, metropolitans, and patriarchs. In Russia there are twenty-four dioceses. With which of them the archiepiscopal dignity shall be united depends on the will of the emperor. The seats of the four metropolitans of the Russian Empire are St. Petersburg, Kiev, Kasan, and Tobolsk. In the Turkish dominions the dignities of Patriarch of Constantinople, Alexandria, Antioch, and Jerusalem still subsist. The Patriarch of Constantinople still possesses the ancient authority of his see; the other three patriarchs exercise a very limited jurisdiction, and live for the most part on the aid afforded them by the Patriarch of Constantinople.

Greek Fire, an inflammable and destructive compound used in mediæval warfare, especially by the Byzantine Greeks. It was poured from cauldrons and ladles, vomited through long copper tubes, or flung in pots, phials, and barrels. The art of compounding it was concealed at Constantinople with the greatest care, but it appears that naphtha, sulphur, and niter entered into its composition.

Greeley (grē'lē), a city, county seat of Weld Co., Colorado, 52 miles N. of Denver, in a rich, irrigated district producing sugar beets, alfalfa, small grains, potatoes, etc. Sugar production and wheat milling are the chief industries. Large numbers of livestock are fed upon the pulp from the sugar plants and add very materially to the wealth of the section. Pop. (1920) 10,883.

Greeley (grē'lē), HORACE, journalist, was born at Amherst, New Hampshire, in 1811, the son of a poor farmer, and learned the art of printing in Vermont. In 1831 he went to New York, where, after an unsuccessful attempt to start the *Morning Post*, the first penny paper, he commenced in 1834 to issue the *Weekly New Yorker*, which ran for seven years. The *Log Cabin*, another weekly, established by him in 1840, reached a circulation of 80,000, and gave him a reputation which ensured the success of his *Daily Tribune*, founded in 1841, and edited by him till his death. In his conduct of it he won high reputation as an editor of marked ability. In 1848 he was elected to Congress, but failed to impress his constituents with the necessity of returning him a second time. In 1851 he visited Europe, and was one of the jurors in the London World's Fair. He opposed the Civil war, but was a firm supporter of the Union and of President Lincoln, and at the close of the war advocated a general amnesty and universal suffrage. In 1872 he was nominated for the presidency in opposition to General Grant, but was defeated. The strain of electioneering and the death of his wife brought on an illness of which he died a few weeks later. Among his works are his *Hints towards Reforms* (1850), *Glances at Europe* (1851), *History of the Struggle for Slavery Extension* (1856), *The American Conflict* (1864), and *Recollections of a Busy Life* (1869).

Greely, ADOLPHUS W., explorer, was born at Newburyport, Massachusetts, in 1844. He served in the Civil war, gaining the rank of captain and receiving severe wounds. In 1867 he entered the regular army as lieutenant, was placed in the signal service in 1868, and in 1881 was placed in command of the Lady Franklin Bay expedition to the Arctic region. After extreme hardships, in which some of the expedition died of starvation, he and his command were rescued in 1884, when the whole of them were at the point of death. In 1887 he was made chief of the signal service, with the rank of brigadier-general. He published *Three Years of Arctic Service. American Weather*, etc.

Green, Mrs. Hetty Howland Robinson, Mrs. Hetty Green, generally believed to have been the world's richest woman, died in New York City, July 2, 1916, in her eighty-second year. She left the bulk of her estate, estimated at $100,000,000, to her son, Col. E. H. R. Green, and her daughter, Mrs. Matthew Astor Wilkes, in trust for ten years.

Green, John Richard, historian, born at Oxford, England, in 1837; ordained curate in 1860, subsequently vicar of St. Philips, Stepney, and librarian to the Archbishop of Canterbury at Lambeth. For some time he wrote constantly for the *Saturday Review;* but he was comparatively little known until the publication in 1874 of his *Short History of the English People,* which secured him immediate fame. It was followed by a larger edition of the same work entitled *A History of the English People* (1877–80), a volume of *Stray Studies from England and Italy,* and by the *Making of England* (1882). In his later years his work was carried on in distressing conflict with lung disease, and he died in 1883. The *Conquest of England,* his last work, was published posthumously by his wife, it having been almost completed by him prior to his death.

Green, Seth, fish-culturist, born at Rochester New York, in 1817; died in 1888. He gained an intimate knowledge of fish and their habits, invented methods for their preservation and propagation, and was in a sense the father of modern pisciculture. Was made superintendent of the fish commission of New York in 1868, and wrote several works on the subject of fish hatching and culture.

Green, Thomas Hill, an English philosophical writer, born in 1838; fellow of Balliol College in 1862, and first lay tutor on that foundation in 1867. In 1877 he was appointed Whyte's professor of moral philosophy; but his work was abruptly closed by his death in 1882. Apart from his *Prologomena to Ethics,* published posthumously in 1883, the bulk of his work was in the form of articles contributed to the *North British* and *Contemporary Reviews.* He was one of the strongest opponents of the English empirical school.

Greenbacks (grēn'baks), the popular name given to the paper currency first issued by the United States government in 1862 during the Civil war, the name being an illusion to its color. It is sometimes used also to include United States bank-notes. It gave name in 1876 to a political party, known as the Greenback Party, which advocated an unlimited issue of government paper currency.

Green Bay, a city, port of entry, county seat of Brown Co., Wisconsin, at the head of Green Bay, Lake Michigan, and the mouth of Fox River. It is a paper manufacturing center, and there are iron, steel, and lumber plants. Retail and jobbing center. Pop. (1910) 25,236; (1920) 31,017.

Green-brier, a popular name in the United States for a very common thorny climbing shrub, *Smilax rotundifolia,* having a yellowish-green stem and thick leaves, with small bunches of flowers.

Green-dragon, a North American herbaceous plant, the *Arisæma Dricontium,* one of the arum family, called also wake-robin. For another green-dragon, see *Dracunculus.*

Green Mountain Boys, a name applied to the Vermont militia in the American Revolution, when led by Ethan Allen to the taking of Fort Ticonderoga, and subsequently it was also given to Vermont regiments in the Civil war. The name was taken from the principal range of mountains in the state.

Greene, Nathaniel, a general of the American revolutionary army, born at Potowhommet, Rhode Island, in 1742. In 1770 he was elected to represent Coventry in the general assembly of Rhode Island, and was soon after excommunicated by the Quakers for taking arms on the prospect of war with Britain. In 1774 he joined the Kentish Guards as a private, and in May, 1775, he was appointed brigadier-general and commander of the Rhode Island contingent in the army before Boston. He gained at once the confidence of Washington, was made major-general, and appointed to the command in New Jersey. At Trenton (1776) and Princeton (1777) he led a division, and in the subsequent fighting he held important commands, and repeatedly distinguished himself. In 1778 he was quartermaster-general, and in 1780 presided at the trial of Major André. In the same year he was appointed to the command of the southern army. In this command he showed the highest ability, worsted Cornwallis with very inferior forces, and succeeded in wresting Georgia and the Carolinas from the British. He is looked upon as ranking next to Washington in military ability in the revolutionary army. He died in 1786.

Greene, ROBERT, a British dramatist, born about 1560; studied at Cambridge, and took his degree of B.A. in 1578, after which he traveled on the continent. He was graduated M.A. in 1583, lived a wild and profligate life, and died in poverty in 1592. His works consist of plays, poems, tales, and tracts. His romances include *Pandosto* (1588), *The History of Arbasto* (1617), *A Pair of Turtle Doves* (1606), and *Menaphon* (1587). His plays comprise *The Honourable Historie of Friar Bacon and Friar Bungay* (1594), *Orlando Furioso* (1594), *Alphonsus, King of Arragon* (1597), and *James IV* (1598). In addition he produced many miscellaneous works. His *Groat's Worth of Wit Bought with a Million of Repentance* (1592) is remarkable for the allusion to Shakespere, 'an upstart crow, beautified with our feathers.' His *Pandosto* furnished the basis for Shakespere's *Winter's Tale.*

Green Earth, an opaque, dull, olive-green, soft, earthy mass, generally met with in cavities in amygdaloidal rocks. It consists of silicate of iron and aluminum, with potassium and sodium in water.

Green-ebony, an olive-green wood obtained from the South American tree *Jacaranda ovalifolia*, nat. order Bignoniaceæ, used for round rulers, turnery, marquetry work, etc., and also much used for dyeing.

Greenfield (grēn'fēld), a town, county seat of Franklin Co., Massachusetts, on the Connecticut River, 36 miles N. of Springfield. It has manufactures of taps and dies, cutlery, silverware, tools, etc. It is on the Boston & Maine R. R. and the Mohawk Trail, and is a trading and automobile center. Pop. (1910) 10,427; (1920) 15,462.

Green Finch, or GREEN LINNET (*Chloris chloris*), a European finch, frequenting hedges and gardens. It is of greenish tint, mingled with brown and gray. Its song is not melodious.

Green Gage (grēn gāj), a variety of the plum, the *reine claude* of the French, introduced into Britain by a person named Gage. It is large, of a green or yellowish color, and has a juicy, greenish pulp of exquisite flavor. It is well known in the United States.

Greenheart (grēn'hart; *Nectandra Rodiæi*), a tree of the nat. order Lauraceæ, a native of Guiana, called also the *bebeeru.* Its wood is hard and durable, and is used in shipbuilding, not being liable to attacks from the Teredo. The bark contains the alkaloid bebeerine.

Greenhouse, a building constructed chiefly of glass for the preservation of delicate plants. A greenhouse is sometimes distinguished from a hothouse by not requiring artificial heat during summer, and from a conservatory in having the plants in pots and not in the ground. The lean-to form, in which advantage is taken of a house or garden wall as a support, is frequently used, but the growth of plants in such houses is one-sided, and the span or arch-roofed structures, with glass on all sides, are to be preferred. The materials used are chiefly glass, wood, and iron.

Greenland (grēn'land; Danish and German, *Grönland*), an island, the second largest in the world, situated on the northeast of the continent of N. America, from which it is separated by Davis Straits, Baffin Bay, and Smith Sound. It extends from 59° 45′ to about 83° N. lat., and has an area of about 850,000 square miles. Like the northern parts of N. America generally, Greenland is colder than the corresponding latitudes on the east side of the Atlantic. In June and July the sun is constantly above the horizon, the ice on the coast is broken up and floats southward, and a few small lakes are opened; but the short summer is followed by a long and dreary winter. The interior, which is lofty and has the appearance of one vast glacier, is uninhabitable, and all the villages are confined to the coasts, which are lined with numerous islands, and deeply penetrated by fiords. The Danish colony extends north, on the western coast, to the Bay of Disco, in lat. 69° N. Cultivation is confined to the low shores and valleys, where grassy meadows sometimes occur with stunted shrubs and dwarfed birch, alder, and pine trees. Attempts to raise oats and barley have failed, but potatoes have been grown towards the southern extremity. Turnips attain the size of a pigeon's egg, and cabbages are very small. The radish is the only vegetable which grows unchecked. The inhabitants are largely dependent upon hunting and fishing. Whale blubber and seal oil are used as fuel. Despite the proximity of America the fiora and fauna are rather of an European character. The land animals are the Esquimo dog, the reindeer, the polar bear, the Arctic fox (blue and white), the ermine, the Arctic hare, and the musk ox. Among the amphibia the walrus and several species of seal are common. The seas abound in fish, the whale and cod fisheries

being of special importance. Sea-fowl are abundant in summer, and largely killed. The chief mineral product is cryolite, but graphite and miocene lignite coal are also found. Oil, eider down, furs, and cryolite are exported. The population, which is chiefly Eskimo, numbers about 12,000, not more than 300 being Europeans. The area embraced in the Danish colony is 46,740 square miles, and for administrative purposes is divided into North and South Greenland. The largest settlement in Greenland is Sydproven, which has a population of about 800.

Greenland was discovered by an Icelander named Gunnbjörn about 876 or 877. It was colonized from Iceland about the end of the tenth century and other Scandinavians followed. In 1264 it was politically united with Norway, and about the middle of the fourteenth century possessed two flourishing colonies on the west coast, named West Bygd and East Bygd. These settlements, however, gradually disappeared from history, and the expeditions sent by Denmark in 1585, 1606, 1636, 1654, and 1670 for the purpose of finding the colony were unsuccessful. Various relics, inscriptions, etc., have been found. In the reign of Elizabeth Captains Frobisher and Davis rediscovered the coast, but nothing was done to explore it until the Danish government in 1721 assisted Hans Egede, a clergyman, to establish a European mission settlement, Good Hope (*Godhaab*). The interior of the country was first crossed from east to west by Nansen in 1888. Peary in 1886 penetrated the ice-cap for 100 miles, lat. 69° 30′ N. He made other trips between 1891 and 1902, traced the northern coast, and discovered some outlying islands in region 83° N. In 1906-08 the Danish Northeast Greenland Expedition under Lylius-Erichsen made detailed explorations of the east coast. Explorations were also conducted by Amdrup, Rasmussen, De Quervain, Koch and others. Consult Peary's *Northward Over the Great Ice;* Nansen's *First Crossing of Greenland;* Rasmussen's *People of the Polar North.*

Green Mountains, a mountain range of New England, commencing near New Haven, Connecticut, and extending north through Massachusetts and Vermont, between Lake Champlain and the Connecticut River. Mount Mansfield, the highest peak, is 4406 feet high. The range is a northern extension of the Appalachians.

Greenock (grēn'uk) a parliamentary burgh and seaport town of Scotland, County Renfrew, about 20 miles west by north of Glasgow. The principal public buildings are the custom-house, the Watt monument, containing the Greenock library, and the Watt Museum and Lecture Hall. There are large industries, including sugar refineries, ship-building yards, and various others. Greenock carries on a considerable coasting and foreign shipping trade, especially with East and West Indies, America, and Australia. Large numbers of vessels unload at Greenock and ascend to Glasgow for cargoes. Pop. 68,142.

Greenough (grēn'ō), Horatio, a noted sculptor, born at Boston, Massachusetts, in 1805; died in 1852. He was graduated at Harvard in 1825, but before this date went to Rome to study art, and after 1826 resided in Italy, principally at Florence, until 1851. An early work was the design from which Bunker Hill monument was constructed. His *Chanting Cherubs* was the first group in marble ever executed by an American sculptor. His *Venus Contending for the Golden Apple* won great admiration at Florence. Among the most important of his works is the colossal *Washington,* ordered by the United States government, and placed in front of the national capitol. A volume of *Essays,* by him, was published in 1853.—Richard S. Greenough, his brother (1819-1904), was also a sculptor of much ability and of a poetic and refined style, but he failed to reach the eminence of the elder Greenough.

Green Paints, are for the most part compounds of copper and of chromium. The best known greens are the following:—*Bremen* green, or verditer, consisting mainly of a basic carbonate of copper. *Brunswick* green, a hydrated oxychloride of copper; but the name is sometimes given to a hydrated basic carbonate, also known as *mountain* green. *Chrome* and *emerald* green are oxide of chromium. *Emerald* green (which see) is also used as synonymous with *Schweinfurt* green. *English* green is a mixture of Scheele's green with gypsum. *Guignet's* green is oxide of chromium prepared in a peculiar way. *Hungary* green is a kind of malachite found in Hungary. *Rinman's* green is got by heating zinc oxide with a cobalt compound. *Saxony* green is an indigo color used in printing. *Scheele's* green is arsenite of copper, and *Schweinfurt* green, *Veronese* green, and *Vienna* green, are also compounds of arsenic and copper. *Verdigris* is a hydrated basic carbonate of copper, often seen in copper saucepans. Besides these are green colors derived from plants. Of these may be mentioned *chlorophyll,* the green color of leaves;

sap green, the juice of *Rhamnus catharticus* or buckthorn, made into a green lake with alumina; *Chinese indigo-green*, etc.

Green River, Kentucky, flows generally west and northwest, and enters the Ohio 200 miles below Louisville. It is navigable for boats for about 200 miles.

Green River, rises in W. Wyoming, flows S. E. into Colorado, and then S. W. and S. through Utah, joining the Grand River, a branch of the Colorado, after a course of 750 m.

Greensand, a name common to two groups of strata, occurring in the southeast of England, the Isle of Wight, etc., the one (lower greensand) belonging to the lower cretaceous series, the other (upper greensand) to the upper cretaceous series; between them is the clay called the gault. They consist chiefly of sands, with clays, limestones, and chert bands. They were named on account of the green color, due to silicate of iron, which some of the beds show, though some tertiary sands are as green. In the United States similar strata exist, known as *marl*, and used for fertilizing purposes. Marl occurs abundantly in New Jersey, Virginia, and North Carolina.

Greensboro, a city, county seat of Guilford Co., North Carolina, 80 miles N. W. of Raleigh. It is the seat of the Greensboro Female College, State Normal and Industrial College and other collegiate institutions. It is one of the leading distributing points in the South and has a large trade in cotton, tobacco, iron, coal, etc., and manufactures of automobiles, motor trucks, textiles, cigars, electric fixtures, iron products, etc. Pop. (1910) 15,895; (1920) 19,861.

Greensburg, a city, county seat of Decatur Co., Indiana, 47 miles S. E. of Indianapolis. It has flour mills, spoke factories, and manufactures of tractors, wire, cigars, bags, silos, pottery, concrete products, etc. Pop. 5345.

Greensburg, a borough, county seat of Westmoreland Co., Pennsylvania, 31 miles E. of Pittsburgh, in a coal and gas region. It has manufactures of flour, engines, glass, nuts, bolts, etc. Pop. (1920) 15,033.

Greenshank, a European sand-piper (*Totanus canescens*), often called the whistling snipe from the shrill note it utters when first flushed.

Greenville, a city, county seat of Washington Co., Mississippi, on Mississippi River, 95 miles N. W. of Jackson. It has very extensive shipments of cotton; also has cottonseed-oil and saw mills. Pop. (1920) 11,560.

Greenville, a town, county seat of Pitt Co., North Carolina, 100 miles N. W. of Raleigh. It is the third largest tobacco market in the State; also has cotton mills, oil and fertilizer factories, etc. Pop. (1920) 5772.

Greenville, a city, county seat of Darke Co., Ohio, 35 miles N. W. of Dayton. It has foundry, machine shops, knitting mills, cigar factories, tobacco warehouses, and manufactures of tractors, etc. Here General Wayne concluded a treaty with the Indians in 1795. Pop. (1920) 7104.

Greenville, a borough of Mercer Co., Pennsylvania, on Shenango River, 85 miles N. of Pittsburgh. It has steel rolling mills, car shops, foundries, etc. Seat of Thiel College (Lutheran). Pop. (1920) 8101.

Greenville, a city, county seat of Greenville Co., South Carolina, 160 miles E. of Atlanta. It is the headquarters of a million-dollar housebuilding concern, and a million-dollar automobile truck corporation; also has extensive cotton interests. It is the seat of Furman University (Baptist), Greenville Woman's College (Baptist) and other collegiate institutions. Pop. (1910) 15,741; (1920) 23,127; with environs, 47,000.

Greenville, a city, county seat of Hunt Co., Texas, 52 miles N. E. of Dallas. It has cotton industries, oil mills, compress, etc. Seat of several collegiate institutions. Pop. (1920) 12,384.

Greenwich (grēn'ich), a parliamentary borough of England, County Kent, on the right bank of the Thames, about 5 miles S. E. of London Bridge. It is built partly on an acclivity, but chiefly on the level ground skirting the river. There are extensive iron foundries and engineering works, rope works, ship-building yards, boiler works, etc. The object of greatest interest is the magnificent hospital, the oldest portion of which was originally a palace of Charles II. It was converted to its charitable purpose in the reign of William III and Mary. As an hospital for aged and disabled seamen of the navy, it was opened in 1705, and subsequently accommodated about 3000. In 1865, however, it ceased to be an asylum for seamen, and is now the seat of the Royal Naval College for the education of naval officers. It also contains a naval museum and picture gallery. Adjoining it are the Royal Naval School for boys, and an infirmary for sick and disabled seamen. Greenwich Park, an open, undulating piece of ground, area 180 acres, finely wooded and well stocked with deer. is a

favorite resort of holiday-making Londoners during the summer. The celebrated observatory of Greenwich, erected by Charles II for Flamsteed, stands upon an eminence in the park. The longitude of all British maps and charts, and also of those issued by the government of the United States of America, as well as many of those published in other countries, is computed from this observatory, which is 2° 20′ 23″ W. from the observatory of Paris, and 18° E. from the meridian of Ferro. Greenwich (including Deptford and Woolwich) was erected into a parliamentary borough in 1832. France, which had long refused to accept the Greenwich meridian, did so in 1911, so that now all the principal countries of the world have adopted this as the basic meridian. Pop. (1911) 95,968.

Greenwich, a residential town and borough of Fairfield Co., Connecticut, on Long Island Sound, 28 miles N. E. of New York. In 1779 Governor Tryon's Tory forces drove General Putnam from the town. Pop. (1910) 16,463; (1920) 22,123.

Greenwood, a city, county seat of Leflore Co., Mississippi, on the Yazoo River, 90 miles N. of Jackson. It is an important shipping point for cotton; also has compress and oil mills, foundry machine shops, etc., sheet iron and metal works, saw and flour mills. Pop. (1920) 7793.

Greenwood, a town, county seat of Greenwood Co., South Carolina, 'the Gateway to the Piedmont.' It has large cotton cloth mills, cottonseed oil mills, fertilizer factories, knitting mills, etc. It is the home of Lander Female College (Methodist; 300 students) and Bailey Military Institute (300 students). Pop. (1920) 8703.

Greg, William Rathbone, an English writer, born in 1809; died in 1881. Besides his miscellaneous essays and pamphlets (collected in 1881 and 1882) he was the author of *Sketches in Greece and Turkey, The Creed of Christendom, Essays in Political and Social Science, Enigmas of Life, Rocks Ahead,* and *Literary and Social Judgments.*

Gregarinidæ (greg-ar-in'i-dē), a class of minute animal organisms, comprising the lowest forms of the Protozoa, found parasitic in various animals, especially the cockroach and earthworm. The Gregarinidæ consist of an outer colorless transparent membrane, with only faint signs of fibrillous structure, inclosing a granular mass, in which there is a nucleus surrounded by a clear space. They are destitute of a mouth, and have not the power of giving out pseudopodia, and hitherto no definite organs have been detected in them.

Grégoire (grā-gwär), Henri, Count, Bishop of Blois, a churchman and statesman of the French revolution, born in 1750. In 1789, while curé of Emberménil, in the district of Nancy, he was sent by the clergy of Lorraine as their representative to the states-general. As one of the secretaries of the constituent assembly he joined the extreme democratic section, and in the convention voted for the condemnation, though not for the death, of the king. Although extreme in his democratic opinions, he was an unflinching Jansenist. He was a member of the Council of Five Hundred, of the corps législatif, and of the senate (1801). On the conclusion of the concordat he resigned his bishopric. He voted against the establishment of the imperial government, and alone in the senate resisted the restoration of titles of nobility. He himself afterwards accepted the title of count, but in the senate was always one of the small body who opposed Napoleon, and in 1814 was one of the first to vote for his deposition. He passed the latter part of his life in retirement, and died at Paris in 1831. He left numerous works, among them *Ruines de Port Royal,* 1801; *Essai Historique sur les Libertés de l'Eglise Gallicane; Histoire des Sectes Religieuses depuis le Commencement de ce Siècle,* 1810 and 1828, and *Annales de la Religion,* 1795-1803.

Gregorian Calendar (g r e - g ōr'i-an), the calendar as reformed by Pope Gregory XIII in 1582 (see *Calendar*). The *Gregorian year* is the ordinary year, as reckoned according to the Gregorian calendar.

Gregorian Tones, in music, a tonal system introduced by Gregory the Great. In the early ages of church music the Greek system of tetrachords, or what was supposed to be the Greek system, was followed. There were in the time of Ambrose of Milan fifteen so-called Greek modes or scales in use. In order to simplify church music he selected four of these scales, the Dorian, Phrygian, Æolian, and Mixo-Lydian, to which he attempted to reduce all the chants and melodies sung in church. This selection of scales was soon found to be too limited. The church singers refused to be bound to it, and it failed to represent the melodies actually in use. In these circumstances Gregory the Great introduced a new reform and extension of church music. To each of the scales admitted by Ambrose he added a new scale or

mode, commencing with the fourth below the keynote of the original scale. These new scales he called *plagal*, while to the four introduced by Ambrose he gave the name of *authentic*. He introduced the practice of naming the tones by the letters of the alphabet. The following is the arrangement of his eight scales:—

1st.	Authentic (Dorian),	D E F G A B C D
2d.	Plagal,	A B C D E F G A
3d.	Authentic (Phrygian),	E F G A B C D E
4th.	Plagal,	B C D E F G A B
5th.	Authentic (Æolian),	F G A B C D E F
6th.	Plagal,	C D E F G A B C
7th.	Authentic, Hyper Dorian or Mixo-Lydian,	G A B C D E F G
8th.	Plagal,	D E F G A B C D

The scale of C, with the semitones between the 3d and 4th, and the 7th and 8th, which in the modern system is called the natural scale, and is the pattern on which all the others are formed, was thus, it will be seen, one of the plagal scales introduced as an innovation by Gregory.

Gregory (greg'o-ri), Patriarch of Constantinople, born in 1730, studied at Mount Athos, lived as a hermit, was made archbishop at Smyrna, and, in 1795, Patriarch of Constantinople. He led an active, tolerant, and benevolent life, promoted schools and the art of printing. In 1798, however, and again in 1806, he was accused of intriguing for the freedom of Greece, and twice banished to Mount Athos, though each time restored to his post after a short interval. But in 1821, when the Greek insurrection broke out in the Morea, his native country, he became once more an object of suspicion to the Porte, and when, shortly after, he allowed the family of Prince Morousi to escape from his guardianship, he was seized as he left the church on the first day of the Easter festival and hanged in his robes of office before the church gate.

Gregory, the name of sixteen popes, of whom we need notice only the following:—GREGORY I, called also the *Great*, born at Rome, of noble family, about 540. He became a member of the senate, and was made prefect of Rome in 573. He expended his inheritance in the foundation of monasteries and charitable institutions, and then took monastic vows himself. Pope Pelagius II sent him on an embassy to Constantinople, and afterwards made him papal secretary. On the death of Pelagius in 590 he was chosen his successor. He displayed great zeal for the conversion of heretics, sending missionaries to Sicily, Sardinia, Lombardy, England, etc., as well as for the advancement of monachism, and the enforcement of clerical celibacy. He died in 604. The works ascribed to him are very numerous; his genuine writings consist of a treatise on the *Pastoral Duty*, *Letters*, *Scripture Commentaries*, etc. —GREGORY VII (*Hildebrand*), born about 1020 at Soana, in Tuscany; passed part of his early life in Rome, became a monk at Cluny, and then returned to Rome with Bruno on the election of the latter to the papal chair. He exercised great influence over Leo IX (Bruno) and his successors, Victor II, Nicholas II, and Alexander II; and under Nicholas II he succeeded in depriving the clergy and people of Rome of a voice in the election to the pontificate by giving the power of nomination to the cardinals alone. On the death of Alexander II (1073) he was raised to the papal chair. His chief aim was to liberate the Church wholly from the domination of the State in political as well as ecclesiastical matters. He therefore prohibited simony and the marriage of priests (1074), and abolished lay investiture (1075), the only remaining source of the authority of princes over the clergy of their dominions. The Emperor Henry IV refused to obey this decree, and Gregory, after deposing several German bishops who had bought their offices of the emperor, and excommunicating five imperial councilors concerned in this transaction, summoned the emperor before a council at Rome to defend himself against the charges brought against him. Henry then caused a sentence of deposition to be passed against the pope by a council assembled at Worms. The pope, in return, excommunicated the emperor, and Henry, finding himself in difficulties, went to Italy and submitted at Canossa (1077) to a humiliating penance, and received absolution. After defeating Rodolph of Suabia, however, Henry caused the pope to be deposed by the Council of Brixen, and an anti-pope, Clement III, to be elected in 1080, after which he hastened to Rome and placed the new pope on the throne. Gregory passed three years as a prisoner in the castle of St. Angelo, and though finally liberated by Robert Guiscard, he was obliged to retire under the protection of Guiscard to Salerno, where he died in 1085. —GREGORY XIII (*Ugo Buoncompagno*), born at Bologna in 1502; created cardinal in 1565; chosen successor of Pius V in the popedom in 1572. He permitted the Cardinal of Lorraine to make a public thanksgiving for the massacre of St. Bartholomew, encouraged plots against Queen Elizabeth, and incited Philip II to attack her. His foreign policy cost him much money for

subsidies to excite enemies to the Turks and heretics, and his financial expedients to fill his exchequer ruined the trade and disturbed the peace of his own dominions. He did much to encourage education, his expenditure for this purpose exceeding two million Roman crowns, out of which many colleges at Rome were endowed. He reformed the Julian calendar (see *Calendar*). He died in 1585.

Gregory, AUGUSTA, LADY, an Irish playwright, born in Roxborough, County Galway, in 1853. She is one of the founders of the Irish National Theater and author of many plays, including *Spreading the News, The Rising of the Moon, The Jackdaw, The Workhouse Ward* and *The Full Moon.*

Gregory, JAMES, mathematician and inventor of the reflecting telescope, born at Drumoak, in Aberdeenshire, about 1638, and educated at Marischal College. In 1663 he published *Optica Promota,* explaining the idea of the telescope which bears his name. He spent some years in Italy, and published at Padua in 1667 a treatise on the *Quadrature of the Circle and Hyperbola.* He became professor of mathematics at St. Andrews in 1668, and at Edinburgh in 1674, but died in 1675.

Gregory, JAMES, physician and author, son of the following, was born at Aberdeen in 1753; died in 1821. In 1780-82 he published his *Conspectus Medicinæ Theoreticæ;* in 1790 he became professor of the practice of physic, and in 1792 he issued his *Philosophical and Literary Essays.*

Gregory, JOHN, physician, grandson of James Gregory, the inventor of the reflecting telescope. He was born in 1724; died in 1773. His works include *Elements of the Practice of Physic,* a *Comparative View of the State and Faculties of Man and Animals,* and *A Father's Legacy to his Daughters.*

Gregory, OLINTHUS GILBERT, mathematician, born in Huntingdonshire in 1774; died 1841. He became mathematical master in the Royal Military Academy at Woolwich, and published a treatise on astronomy and several mathematical works, of which his *Treatise on Mechanics* was of most importance.

Gregory, THOMAS WATT (1861-), an American cabinet officer, born at Crawfordsville, Miss., educated at Southwestern Presbyterian University and the University of Virginia. He was admitted to the Texas bar in 1885, and became attorney-general of the United States in the cabinet of President Wilson in 1914, and resigned March 1, 1919.

Gregory of Nazianzus (*Gregorius Nazianzēnus*), a father of the Greek Church, born near Nazianzus, in Cappadocia, between 318 and 329; studied at Athens, and in 355 and 356 taught rhetoric in that city. He afterwards retired for some time with Basil to the Desert of Pontus. He began to preach in 362, and between 365 and 374 was associated with his father in the bishopric of Nazianzus. He went to Constantinople about 378 or 379 to oppose the Arians, and was appointed bishop of that see by Theodosius in 380, but in the following year retired to his former charge of Nazianzus. He died in 389 or 390. His works consist of letters, sermons, and poetry. His eloquence is nearly on a level with that of Basil and Chrysostom. His festival is on 9th May.

Gregory of Nyssa, a father of the Greek Church, brother of St. Basil, born at Sebaste, Pontus, about 332; died about 398. By his brother's influence he was made Bishop of Nyssa, in Cappadocia. Having opposed the Arians, he was banished at their instigation by Valens from 375 to 378. He took a prominent part in the Councils of Constantinople from 381 to 394. His festival is on 9th March. His works consist of dogmatic treatises, Scripture commentaries, sermons, letters, etc.

Gregory of Tours (*Gregorius Florentius*), historian of Gaul, born in Auvergne in 539 or 544; died at Tours in 595. He became Bishop of Tours in 573. He had the courage to oppose Chilperic and Fredegonde in their violent courses, and acted the part of a peacemaker in the dynastic quarrels of the period. His *Historia Francorum* is a valuable chronicle of sixth century events.

Gregory Thaumaturgus, SAINT, born in Pontus about 210 A. D.; became a Christian at an early age, and was a disciple of Origen; was bishop of Neocæsarea, from 244 till his death in 270. His life and miracles are narrated by Gregory of Nyssa.

Gregory the Illuminator, SAINT, the apostle of Armenia, born about 258 A.D. From 302 to 331 he was patriarch of the Armenian Church, but the last years of his life were passed as a hermit. He died about 342.

Gregory's Mixture, a popular stomachic and aperient medicine, consists of two parts of rhubarb, four of calcined magnesia, and one of ginger. It may be used

with benefit occasionally, but not systematically.

Greifenberg (grī'fn-berh), the name of several places in Prussia, particularly a walled town, province of Pomerania, government of Stettin. Pop. (1905) 7208.

Greifenhagen (grī'fn-hä-gĕn), a town of Prussia, province of Pomerania, government of Stettin. It has manufactures of woolen and linen cloth. Pop. 6473.

Greifswald (grīfs'vâlt), a town of Prussia, province of Pomerania, on the navigable river Rick, about 3 miles above its entrance into the Baltic. It contains a university, founded in 1456, attended by about 600 students, and possessed of a library (100,000 vols.), museum, observatory, etc. It has manufactures of machinery, oil, paper, and tobacco; and a considerable shipping trade. Greifswald was one of the Hanse towns about 1270; was assigned to Sweden by the Peace of Westphalia 1648; was occupied successively by various northern powers, and finally ceded to Prussia in 1815. Pop. (1905) 23,750.

Greiz (grīts), a town of Germany, principality of Reuss Greiz, in a valley on the right bank of the Elster, 16 miles south of Gera. It is the residence of the elder branch of the Reuss family; is walled, well built, and has a castle and palace. Pop. (1905) 23,114.

Grenada (gren-ä'da), one of the British West Indian Islands; about 85 miles northwest of Trinidad; oblong in form, 24½ miles long, N. and S., and 10 miles broad; area 133 square miles. The island is traversed north to south by an irregular mass of volcanic mountains, attaining elevations of 3000 and 3200 feet above sea-level, and having lateral branches of lower hills. Cocoa, sugar, rum, and spices stand first in the exports. The island has a lieutenant-governor, and a local legislature consisting of a council and a house of assembly of seventeen elected members. The capital is St. George Town. Grenada was discovered by Columbus in his third voyage in 1498, and colonized about the middle of the seventeenth century by the French, who exterminated the Caribs. In 1762 it was taken by the British, and though recaptured by the French in 1779 was restored to Britain in 1783. Pop. 65,627, of whom only a few hundreds are whites.

Grenade (gre-nad), a small explosive shell, thrown by the hand. The term was first used by Du Billey, in reference to the siege of Arles (1536). Until about the end of the 17th century, when musketry became common, soldiers of the line were trained to throw grenades, hence the name grenadier (*q. v.*). Discarded for a long time the grenade was revived by the Japanese in the Russo-Japanese war (1904-05). Its importance in warfare grew, and during the European war grenades of various types were used by all the belligerents. The hand grenade of 1918, made of cast iron or composition metal, was ovoid in form and was exploded by an automatic device. It differed from the earlier models in that instead of exploding at the point of contact it went off while still in the air. These grenades were charged with suffocating, tear-producing, or incendiary gases, which were as effective as the splintered shell. A form of grenade much used in the trenches was made of a cane handle with a metal head, containing the bursting charge of lyddite, and the detonator to effect the explosion when the missile struck; attached to the handle was a piece of cloth to act as the tail and make the grenade strike on its detonating head. In the *rifle grenade* a stout cylindrical tube is inserted into the muzzle of an ordinary gun. These grenades could be thrown 35 or 40 yards. For longer distance the rifle grenade was used. The latest model of rifle grenade is cylindrical in form and can be fired with an ordinary cartridge. The grenade is inserted into a wide-mouthed attachment that makes the rifle look like an ancient blunderbuss. Pointed into the air at an angle of 45 degrees a rifle grenade weighing one pound can be thrown a distance of more than 200 yards. The *mine grenade* is the invention of N. W. Aasen, a Norwegian engineer. It consists of a cylinder with a conical point, containing the projectiles and explosive charge as well as the mechanism necessary to force it up from the ground where it is buried.

Grenadier (gren-a-dēr'), originally a soldier destined to throw the hand-grenades. Soldiers of long service and acknowledged bravery were selected for this service, so that they soon formed a kind of *élite*. There were at first only a few grenadiers in each regiment. Companies of grenadiers were formed in France in 1670, in England a few years later. With the development of the musket the name soon became only a *souvenir* of the ancient practice; the troops so called generally formed one battalion of a regiment, distinguished by the height of the men and a particular dress, as for instance, the high bearskin cap. With the British and French the grenadier company was the first of each battalion. The title in the British army

remains only in the regiment of Grenadier Guards.

Grenadine (gren'a-dēn), a thin gauzy silk or woolen fabric, plain, colored, or embroidered, used for ladies' dresses, shawls, etc.

Grenadines (gren'a-dēns), or GRENADILLES, a chain of small islands and rocks in the West Indies, between the islands of Grenada and St. Vincent; principal island, Carriaco. They produce coffee, indigo, cotton, and sugar. Pop. 6796.

Grenfell (gren'fel), WILFRED THOMASON, a medical missionary, born near Chester, England, in 1865. He began his career as a medical missionary in England in 1887, and subsequently became superintendent of a Labrador branch of the Mission to Deep Sea Fishermen. His work among the people of Labrador has been of the most self-sacrificing and beneficial character, and he has brought about great improvement in their sanitary and other conditions, including, recently, the introduction of the Lapland reindeer to that country. Has written several works on Labrador and his experiences.

Grenoble (gre-nō'bl), a fortified town of Southern France, capital of the department of Isère, finely and strongly placed on the Isère, 60 miles southeast of Lyons. Grenoble occupies both sides of the river, which is crossed by three bridges, and lined by fine quays. It has a cathedral, and a more noteworthy church (Saint-André), with the tomb of Bayard; a public library of 170,000 volumes and 7500 MSS.; a college, museum, bishop's palace, courthouse, arsenal, and extensive public gardens. The manufactures consist of gloves, which may be considered the staple, linen and hemp goods, liqueurs, leather, etc. Grenoble existed in the time of Cæsar; and Gratian, who had improved it, changed its name from Cularo to Gratianopolis. Pop. (1910) 77,438.

Grenville (gren'vil), GEORGE, a British minister, younger brother of Earl Temple, and father of William Wyndham, the first Lord Grenville; born in 1712; died in 1770. He became treasurer of the navy in 1754; secretary of state and subsequently Irish lord of the admiralty in 1762; first lord of the treasury and chancellor of the exchequer in 1763. In 1763 he introduced a scheme of colonial taxation, and in 1764 proposed a stamp tax to be levied in the American colonies, which was one of the proximate causes of the American war of independence. In 1765 he retired from office, and was replaced by Lord Rockingham. The *Grenville Papers* (1852-53) contain his most important political correspondence.

George Grenville.

Grenville, WILLIAM WYNDHAM, LORD, third son of the above, was born in 1759. In 1783 he was appointed paymaster-general of the army; in 1789 became speaker, and in the same year became secretary of state for the home department. In 1790 he was raised to the peerage as Baron Grenville, and from 1791 till Pitt's resignation in 1801 held the post of foreign secretary. On the return of Pitt to office in 1804 he declined to join him, and continued in opposition till Pitt's death, when he became the head of a coalition ministry, including Fox and Grey, 1806. The ministry resigned in 1807, after having passed an act for the abolition of the slave trade. He did not again take office. He died in 1834.

Gresham (gresh'am), SIR THOMAS, a merchant of London, born in 1519. In 1552 he was sent as agent of Henry VIII's money affairs to Antwerp, where in two years he paid off a heavy loan, and raised the king's credit considerably. On the accession of Elizabeth he was deprived of his office, but it was soon restored to him, and he was also knighted. In 1556 he erected at his own expense the Royal Exchange for the merchants of London. He died in 1579. The 'Gresham Law,' in finance, is the principle that a less valuable currency inevitably supplants and drives out the more valuable, in direct proportion to the abundance of the former medium.

Gresham, WALTER Q., statesman, was born near Lanesville,

Indiana, in 1832; died in 1895. He was elected to the legislature as a Republican in 1856, served through the Civil war, retiring as brevet major-general, and was United States district judge for Indiana, 1869-82. He was appointed postmaster-general in 1882; secretary of state, in Cleveland's cabinet, in 1892.

Gretna, county seat of Jefferson Parish, La., on the Mississippi, opposite New Orleans. It has cotton and other interests. Pop. 7197.

Gretna Green (gret'na), a village of Scotland, 8 miles north of Carlisle, was long notorious for the celebration of the marriages of fugitive lovers from England. To conclude a lawful (though irregular) marriage in Scotland, it was only necessary for an unmarried couple to go and declare themselves man and wife before witnesses, and it was in this way that these runaway couples were married; but such marriages were put an end to in 1856, by an act declaring that no irregular marriage in Scotland should be valid unless one of the parties had resided in Scotland for twenty-one days next preceding such marriage.

Greuze (greuz), JEAN BAPTISTE, a famous French painter, born in Burgundy, 1726. Although he devoted some time and attention to historical subjects, he later confined himself to depicting scenes of the family life of the *bourgeois* or middle class. As a colorist he occupies a high place. He died in 1805.

Grévy (grā-vē), FRANÇOIS PAUL JULES, French president, was born at Mont-sous-Vaudrez, France, in 1807; died in 1891. He took part in the revolution of 1830 and afterwards, as a lawyer, defended in the courts some of his fellow-insurgents. He was vice-president of the Constitutional Assembly of the 1848 republic, and president of the National Assembly of the new republic, 1871-73 and 1876. In 1879 he was chosen president of the French republic by a large majority and reëlected in 1886, but resigned in 1887 in consequence of a scandal in which his son-in-law was implicated.

Greville (grev'il), SIR FULKE, LORD BROOKE, an English writer; born in 1544. Having studied at Cambridge and Oxford and made the tour of Europe, he became a courtier, and enjoyed the favor of Elizabeth, James I, and Charles I. In 1628 he was stabbed by an old servant, and immediately expired. He wrote the life of Sir Philip Sidney; *Cælica*, a collection of 109 songs; *Alaham* and *Mustapha*, two tragedies, etc.

Greville, HENRY. See DURAND, ALICE.

Grey (grā), CHARLES, EARL, an English statesman, eldest son of Charles, first Earl Grey; born in 1764; died in 1845. He was educated at Eton and at King's College, Cambridge. In 1786 he was returned to Parliament as member for Northumberland. On the accession of the Grenville ministry in 1806, Grey, now Lord Howick, was made first lord of the admiralty, and on the death of Fox succeeded him as secretary for foreign affairs and leader of the House of Commons. The death of his father in 1807 raised him to the House of Peers, and from this period up to 1830 he headed the opposition in the Lords, and especially opposed the proceedings against Queen Caroline. On the accession of William IV and the retirement of the Wellington ministry, Earl Grey was summoned to office. The great event which marks his administration is the passing in 1832 of the first reform bill.

Grey of Fallodon, EDWARD GREY, first Viscount, British statesman, foreign secretary from 1905 to 1916, was born in 1862 and held office as under-secretary for foreign affairs from 1892-95. It was during his control of the foreign office that the European war broke out (1914). He was appointed Ambassador to the United States in 1919.

Grey, SIR GEORGE, a British colonial governor, was born at Lisbon, Portugal, in 1812; died in 1898. He traveled in Australia in 1837 and published an account of his journey. He was successively appointed governor of Southern Australia, of New Zealand, of the Cape of Good Hope.

Grey, LADY JANE, an interesting figure in English history, the daughter of Henry Grey, marquis of Dorset, afterwards duke of Suffolk, by Frances, daughter of Charles Brandon, duke of Suffolk, and Mary, younger sister of Henry VIII. in whose reign Lady Jane was born, in 1537. She displayed much precocity of talent; and under the tuition of Aylmer, afterwards bishop of London, she acquired a knowledge of the learned languages, as well as French and Italian. She was married to Lord Guilford Dudley, fourth son of the Duke of Northumberland, in 1553. Edward VI, who died in 1553, was induced on his deathbed to settle on her the succession to the crown. The council endeavored to keep his death secret, with a view to secure the persons of the princesses, Mary and Elizabeth, and when Mary discovered the design the council proclaimed Lady

Jane queen. On the approach of Mary, however, the council deserted Lady Jane, and Mary was proclaimed queen. Jane was now confined to the Tower. She and her husband were arraigned, and pleaded guilty of high treason; but their doom was suspended, and it was not until after the suppression of the rebellion of Sir Thomas Wyatt, in which the Duke of Suffolk, Lady Jane's father, had participated, that the sentence was executed. She and her husband were beheaded on Tower Hill, February 12, 1554.

Grey. See *Gray.*

Grey Friars. See *Franciscans.*

Greyhound (grā'hound), a variety of dog, distinguished by a greater length of muzzle than any other; very low forehead, short lips, thin and long legs, small muscles, contracted belly, and semi-pendent ears. There are several varieties, as the Irish greyhound, the Scottish, the Russian, the Italian, and the Turkish. The common greyhound is of an elegant make of body, and is universally known as the fleetest of dogs. A good hound has a fine, soft, flexible skin, with thin, silky hair, a great length of nose, contracting gradually from the eye to the nostril, a full, clear, and penetrating eye, small ears, erect head, long neck, chest capacious, deep, but not wide, shoulders deep and placed obliquely, ribs well arched, contracted belly and flank, a great depth from the hips to the hocks of the hind-legs, fore-legs straight, and shorter than the hinder. The name appears to have no reference to the color, but is derived from the Icelandic *grey*, a dog. They are chiefly used in the sport of coursing, a work for which their peculiar shape, strength, keenness of sight and speed make them exceedingly well fitted. This sport is preferred by many to horse-racing. (See *Coursing.*)

Greytown (grā'toun), SAN JUAN DE NICARAGUA, or SAN JUAN DEL NORTE, the principal seaport of Nicaragua. It has considerable trade in the exportation of hides, India rubber, mahogany, and fruits. Pop. about 2500.

Grieg (grēg), EDVARD, a Norwegian composer and pianist, born in 1843; died in 1907. He is best known by his compositions for the piano; but he also wrote orchestral suites, cantatas, quartets, trios, etc., as well as a number of charming songs. His works belong to the modern Romantic school and are distinctly Scandinavian in character.

Griffin (grif'in), or GRYPHON, a fabulous monster of antiquity, also common in heraldry, commonly represented with the body, the feet, and claws of a lion, and the head and wings of an eagle. Legend assigned them as guardians of the gold.

Griffin, a city, county seat of Spalding Co., Georgia, 43 miles S. of Atlanta. It is a cotton shipping point and has manufactures of Turkish bath towels, hosiery, buggies, etc. Pop. (1920) 8240.

Grillparzer (gril'pär-tsêr), FRANZ, an Austrian poet and dramatist, born at Vienna in 1791; died, 1872. Having entered the service of the imperial court, he rose through various dignities, and at last was appointed member for life of the imperial council. He was the author of lyrical and other poems, a novel, travels, etc., and of the dramas *Sappho, Das Goldene, Vliess, Des Meeres und der Liebe Wellen.*

Grilse (grils), the name given to the young of the salmon (smolts) after they return for the first time from the sea to fresh water. They then sometimes weigh from 5 to 8 or 9 lbs.

Grimaldi Family (gre-mal'dē), one of the four families of the high nobility in Genoa. The lordship of Monaco belonged, for more than 600 years (beginning with 980), to the Grimaldi, and the ruler is still a Grimaldi. With the Fieschi they always played an important part in the history of Genoa, especially in the disputes between the Ghibellines and the Guelfs, to which latter party both families belonged.

Grimaldi's Fringes, a term in optics given to the colored bands observed when a beam of light passing through a narrow slit falls on a screen. They are due to interference of the luminous waves, and are named from Francesco Maria Grimaldi, who wrote a treatise on the subject. See *Diffraction.*

Grimm (grim), FRIEDRICH MELCHIOR, BARON, a German man of letters, who lived mostly in Paris and wrote in French. He was born in 1723 at Ratisbon, and having finished his studies, he went to Paris and there became acquainted with Jean Jacques Rousseau, Diderot, D'Alembert, D'Holbach, and other Parisian philosophers. He corresponded with Catharine II of Russia, Gustavus III of Sweden, and other great personages. Frederick the Great among others gave him marks of great esteem. In 1776 he was appointed envoy from the Duke of Saxe-Gotha to the French court, and honored with the title of baron. On the revolution breaking out he retired to Gotha, where he died in 1807. His

Correspondance Littéraire possesses great literary and historical value.

Grimm, Jakob Ludwig, a German philologist, born at Hanau in Hesse-Cassel, 1785. He was educated partly at Cassel, and finally at Marburg University. In 1806 he became librarian to Jerome Bonaparte, king of Westphalia, and from 1816 to 1829 he occupied the post of second librarian at Cassel. From 1830 to 1837 he resided at Göttingen as professor and librarian, lecturing on the German language, literature and legal antiquities. Having, along with other six professors, resisted the unconstitutional encroachments of the King of Hanover, he was banished, and after his retirement to Cassel, he was, in 1841, called to Berlin as a professor and member of the Academy of Sciences. He sat in the National Assembly of 1848, and in that of Gotha in 1849. From that time till his death, which took place at Berlin, 1863, he occupied himself only with his various publications. He wrote on German mythology, German legal antiquities, the history of the German language, and published old German poems, etc. His two greatest works, both unfinished, are his *Deutsche Grammatik* ('German Grammar,' vols. i.—iv., 1819-37), and his *Deutsches Wörterbuch* ('German Dictionary') commenced in 1852, in conjunction with his brother Wilhelm, and being gradually completed by eminent scholars. He also published, in company with his brother, the *Kinder- und Hausmärchen*, one of the most popular collections of juvenile fairy tales.

Grimm, Wilhelm Karl, brother of the preceding, born 1786, was educated at Cassel and Marburg, and in 1830 he followed his brother to Göttingen, and obtained a professorship. He joined in his brother's protest against the abrogation of the new Hanoverian constitution, and was deprived of his office. Having obtained an appointment in Berlin, he died in that city in 1859. He devoted himself especially to the German mediæval poetry, and published a treatise, *Ueber die deutschen Runen*, a translation of *Altdänische Heldenlieder, Balladen und Märchen*, etc., all with valuable introductions and disquisitions.

Grimma (grim'ma), a town, Kingdom of Saxony, on the Mulde, 17 miles E. S. E. of Leipzig, charmingly situated, and with some interesting old buildings. Pop. (1905) 11,182.

Grimm's Law, so called from its discoverer, Jakob Grimm, formulates the principle of the interchange of the mute consonants in the Aryan languages, in words derived from the same roots. For example: *p*, *b*, and *f* in Latin, Greek, and Sanskrit are in Gothic and English, Dutch, etc., respectively represented by *f*, *b*, and *b*, and in Old High German by *b* (*v*), *f*, and *p*. The subjoined table exhibits the principal mutations:—

	Labials.	Dentals.	Gutturals.
Greek (Latin, Sanskrit)	*p, b, f*	*t, d, th*	*k, g, ch*
English (A. Sax.), Gothic, etc.	*f, p, b*	*th, t, d*	*h, k, g*
Old High German.	*b* (*v*), *f, p*	*d, g, t*	*g, ch, k*

As examples:—E. *father* = L. *pater*, Gr. *patēr*, Skr. *pitri*; E. *brother* = L. *frater*, Gr. *phratēr*, Skr. *bhratar*; E. *kin* = *genus*, Gr. *genos*; E. *head*, A. Sax. *heafod* = L. *caput*, Gr. *keph* (*alē*), etc.; E. *thin* = L. *tenuis*, Gr. *tanaos*. Certain exceptions to the law are explained by a law subsequently discovered, called Verner's law.

Grimsby (grims'bi), Great, a borough and thriving seaport of England, County of Lincoln, on the Humber. The docks occupy an area of about 140 acres, and there is a large trade with continental ports. Grimsby is one of the most important fishing ports of the kingdom. Pop. (1911) 74,663.

Grimsel (grim'zl), a pass in Switzerland at the eastern extremity of the Bernese Alps, 7103 feet in height, and connecting the valleys of the Aar and the Rhone.

Grindelwald (grin'dl-vâlt), one of the most beautiful of the upper Alpine valleys of Switzerland, about 36 miles southeast of Berne, containing two immense glaciers. The village of Grindelwald consists of picturesque cottages, and the inhabitants, 3370 in number, are chiefly employed in rearing cattle.

Grinding (grind'ing), a mechanical process in which certain effects are produced by attrition. This process prevails in various mechanical arts, as in grinding corn, etc., the object of which is to reduce the materials to a fine powder; or in grinding metals for the purpose of giving them a certain figure, polish, or edge. In the first case the grinding or crushing is effected by rough stones, or, as in crushing ores, between heavy metal cylinders, or by a heavy stone or iron cylinder revolving upon a smooth plate. (See *Mill.*) The grinding of cutlery is effected by means of the grindstone (see below); emery powder grinds glass lenses and specula. Ornamental glass is ground into facets by stones and lap-wheels. Diamonds and other precious stones are ground with diamond dust. What is called *dry grinding*

is the grinding of steel with dry grindstones. The points of needles are produced by this means, also the finishing of steel pens. Sand-jet grinding is a process in which abrasion is effected by the percussion of small hard particles on a plain surface, sharp siliceous sand being impelled by a blast artificially produced of steam or of air. By the use of flexible jointed connecting tubes the jet can be turned in any direction.

Grindstone (grind'stōn), a cylindrical stone, on which sharpening, cutting, and abrasion are effected by the convex surface while the stone is revolving on its axis. They are made of sandstone, or sandstone grit of various degrees of fineness.

Grinnell, a city of Poweshiek Co., Iowa, 55 miles E. by N. of Des Moines. It is the seat of Grinnell College. Products are automobiles, gloves, washing machines, etc. Pop. 5362.

Grinnell Land, a large Arctic island lying west of Northern Greenland and north of Ellesmere Land. From its northern coast set out Peary's expedition which discovered the North Pole in 1909. It was named after Henry Grinnell (1799-1874), a New York merchant, who supplied the funds for the De Haven and Kane Arctic expeditions.

Gripes (grīpz), a painful affection of the bowels, caused by constipation or diarrhœa. If spasms occur, the term 'colic' is applied.

Grippe (grip), LA. See *Influenza.*

Griqualand East (grē'kwa-land), a region of South Africa, formerly known as No Man's Land, lying south of Natal between Pondoland and Basutoland. It was incorporated with Cape Colony in 1874. Area, 7549 square miles. Pop. about 200,000.

Griqualand West, a district of South Africa north of the Orange River, and west of the Orange Free State; 180 miles from east to west, and 120 from north to south; area, about 15,190 square miles. The prevailing character of the surface is that of undulating grassy plains suitable for grazing. Previous to the discovery of the diamond fields in the basin of the Vaal River, Griqualand was little known. In 1870 large finds of diamonds in that district began to attract wide notice, and in 1871 Waterboer, the Griqua chief, ceded all his rights to the British government, and the territory was incorporated with Cape Colony. The chief centre of the diamond-mining industry, and the seat of government, is Kimberley. The Griquas are a mixed race sprung from the intercourse of the Boers with their Hottentot slaves. Pop. about 100,000.

Griselda (gri-zel'dȧ), the name of the famous heroine of a popular mediæval tale, first met with in Boccaccio's *Decameron*, probably with an historical foundation. Chaucer describes her as 'the Patient Griselda,' in one of his Canterbury tales. A poor girl, married to a marquis, he put her patience and obedience to the severest tests. She bore all these with loving wifely fortitude and they lived lovingly together afterwards.

Grisi (grē'sē), GIULIA, a celebrated Italian vocalist, born at Milan, 1811 or 1812. After having studied music at Bologna, and made her *debut* in Rossini's Zelmira, she appeared at Milan as Norma. She acquired great celebrity at Paris, in England, and America. She subsequently married Mario, the great tenor singer. Her voice gave way in her later years, and she died at Berlin in 1869. Her principal character was Norma.

Gris-Nez (grē-nā), CAPE, a headland, the northwest extremity of France, dep. Pas-de-Calais, the nearest point of the French shore to that of Britain, the distance being barely 21 miles. It has a revolving light, 195 feet high.

Grisons (grē-sōn); (Ger. *Graubünden*), the largest and most easterly canton of Switzerland, bordering on Austria and Italy; area, 2773 square miles. Its boundaries and interior consist almost entirely of mountain chains, including more than twenty peaks above 9000 feet. The canton may be regarded as embracing three great valley districts, of which the Upper and Lower Engadine (Inn valley) attain considerable breadth. The Inn, which flows to the Danube, and the Vorder and Hinter Rhine, are the principal rivers. The lakes are numerous, and many of them present scenery of the most magnificent description. The climate varies greatly, ranging from the perpetual winter of the mountains to the almost Italian air of some of the valleys. The canton is in general pastoral, feeding large numbers of cattle and sheep. The mountain forests supply much timber. A considerable transit trade is carried on between Italy and Germany. The canton was admitted into the Confederation so late as 1803. Both the Protestant and the Roman Catholic religion are established. The language of the public acts is German, and the people speak Ger-

man, Romansch, or Italian. Pop. 104,520.

Griswold (griz'wuld), RUFUS WILMOT, an American writer, born in Vermont in 1815. After having traveled extensively both in his own country and in Europe, he became successively a printer, a Baptist preacher, and a journalist. He was the author of *The Poets and Poetry of America*, etc. He was one of the editors of Edgar A. Poe's works. He died in 1857.

Grit, is a sandstone, coarse-grained, with particles more or less angular, connected by a cement of a hard siliceous nature.

Grivegnée (grēv-nyā), a town in Belgium, province of Liége, on the Ourthe. It manufactures steam-engines, and has worsted and fulling mills. Pop. 10,550.

Grizzly Bear, a large and fierce American bear, inhabiting the Rocky and neighboring mountains. Its name is derived from its grayish, grizzled hair. It feeds on both vegetable and animal food, grows at times to the length of 9 feet, and is dreaded by hunters from its great strength and savage disposition.

Groat (grōt), an English silver coin, coined by Henry III in 1249, and by Edward III, in 1351. It was equal to fourpence in value. A coin of this value, the *fourpenny-piece*, was revived in 1835, but none have been struck since 1856, and all are now withdrawn from circulation.

Groats, the seeds of oats prepared as an article of food by being deprived of their hulls. They are much used in the preparation of gruel for invalids.

Grodno (grod'nō), a town of Russian Poland, capital of the government of same name, on the Niemen, 160 miles northeast of Warsaw, a poorly-built place, the principal edifice being a palace erected by Alexander III. The manufactures consist of woolen, linen, and silk goods, firearms, etc. Pop. 46,871.—The government has an area of 14,931 square miles, largely occupied by pine forests and swamps. Pop. 1,826,630.

a a, Groins.

Groin, the angular curve made by the intersection of two semi-cylinders or arches. It is either regular or irregular:—*regular*, as when the intersecting arches are of the same diameters and heights; and *irregular*, when one of the arches is semicircular, and the other semi-elliptical. In Gothic architecture groins are always ribbed.

Gromwell (grom'wel), the name of plants of the genus *Lithospermum*, nat. order Boraginaceæ, containing a number of widely distributed species, several of which are natives of America. The seeds of *L. officinale* are occasionally used as a diuretic.

Groningen (grō'ning-en), a town of Holland, capital of a province of same name, situated on the river Huns, here converted into a canal, 92 miles northeast of Amsterdam. It is a rich place, adorned with many excellent buildings, and has numerous canals crossed by bridges. The principal edifices are the cathedral, a fine exchange, and the university. It has manufactures of white lead, soap, etc., oil, fulling, and saw mills, and an excellent harbor, with an active trade. Pop. 67,563.—The province forms the northeastern portion of Holland; area, 790 square miles. It is protected against the encroachments of the sea by dykes, is very level, and is intersected by innumerable canals. The inhabitants, 299,602, nearly all belong to the Calvinistic church.

Gronovius (gro-nō'vi-us; properly *Gronov*), the name of several Dutch classical scholars:—(1) JOHANN FRIEDRICH, born at Hamburg in 1611, succeeded Daniel Heinsius as professor of belles-lettres at Leyden (1658), and died there in 1671. His editions of Livy, Statius, Justin, Tacitus, Gellius, Phædrus, Seneca, Sallust, Pliny, Plautus, etc., are valuable.—(2) His son JAKOB, born at Deventer in 1645; studied there and at Leyden. He afterwards became professor of belles-lettres at that university, and died in 1716. He edited Tacitus, Polybius, Herodotus, Pomponius Mela, Cicero, Ammianus Marcellinus, etc., and compiled a *Thesaurus Antiquitatum Græcarum* (Leyden, 1697, thirteen vols. fol.).—(3) His son ABRAHAM, born at Leyden in 1694, edited Justin, Pomponius Mela, Tacitus, and Ælian. He died at Leyden in 1775.

Groote Eylandt (grō'te ī'lant; 'great island'), the largest island in the Gulf of Carpentaria, north of Australia, belonging to the colony of S. Australia; greatest length and breadth 40 miles each.

Gros (grō), ANTOINE-JEAN, BARON, a French historical painter, born at Paris in 1771. He studied art

under David, and subsequently became a staff officer in the French army. In this position he produced his picture of the Victor of Arcola, by which he secured the favor of Napoleon. In 1804 he produced his *Plague at Jaffa*, with Napoleon visiting the sick, a work which was crowned at the Louvre. He painted various battle scenes; but his chief work is probably the Cupola of St. Geneviève at Paris, exhibiting the saint protecting the throne of France, represented by Clovis, Charlemagne, St. Louis, and Louis XVIII. The artist received for it 100,000 francs and the title of baron. The rise of the romantic school deprived him of his popularity, and he drowned himself in the Seine in 1835.

Grosbeak (grōs'bēk), a general popular name for birds of at least three groups belonging to the conirostral division of the Insessores. The first comprises the cross-bills; in the second group is the East Indian representative genus *Paradoxornis*, with the beak large and parrot-like, but not crossing; the third group includes the pine grosbeak (*Pinicŏla enucleātor*) and the bullfinch. The term grosbeak was given to birds which had beaks proportionally larger than in the most familiar forms of bird life.

Groschen (grō'shen), a name for German coins of which the oldest known were struck in Trèves in 1104. In 1525 the groschen was divided into twelve pfennige. In the currency system existing up till 1872, the groschen was a silver coin = 1 1/5*d.* sterling, there being 30 to the *thaler* of about 3*s.* sterling.

Grose (grōs), FRANCIS, an English antiquary, born in 1731. Having dissipated the fortune inherited from his father, he turned his attention to the study of antiquities. In 1773 he commenced the publication in numbers of his *Views of Antiquities in England and Wales*. In 1789 he made a tour in Scotland for the purpose of illustrating the antiquities of that country. Before completing it, however, he proceeded to Ireland, with the view of collecting its antiquities, but was suddenly carried off by apoplexy in 1791. His name is now perhaps chiefly remembered from his connection with Burns, who wrote his *Tam o' Shanter* for him. Captain Grose also wrote a *Treatise on Ancient Armour and Weapons*, a *Classical Dictionary of the Vulgar Tongue*, and other interesting publications.

Gross, in opposition to *net*, is applied to merchandise, including the weight of that in which it is packed. Thus we say, 'The bag of coffee weighs 9 cwts. *gross*,' that is, including the weight of the bag.

Gross, SAMUEL D., an eminent surgeon, born at Easton, Pennsylvania, in 1805; died in 1884. He was the founder and chief editor of the *Medico-Chirurgical Review*, and president of the American Medical Association in 1867. He became professor of surgery in the Jefferson Medical College of Philadelphia in 1856, and was the author of some valuable works on surgery.

Grossenhain (grōs'en-hīn), a town, kingdom of Saxony, 20 miles N. W. of Dresden, on the left bank of the Röder. Woolen and cotton goods, etc., are manufactured. Pop. 12,064.

Grosseteste (gros'test), ROBERT, an eminent English scholar and prelate, was born about the year 1175; studied first at Oxford, and then went to Paris, where he mastered the Hebrew and Greek languages. On his return to England he became lecturer in the Franciscan school at Oxford, and acquired a great reputation for his linguistic abilities, his skill in logic, etc. In 1235 he was appointed Bishop of Lincoln, but soon came into collision with Pope Innocent IV on the question of the induction of foreigners into English benefices. He refused to institute the pope's nephew, Frederick di Lavagna, to a canonry at Lincoln, and disregarded the papal fulminations which he thus incurred. He died in 1253. His writings, few of which have been published, are very voluminous.

Grosseto (grō-sā'tō), a province of Tuscany, Italy; area, 1712 square miles; pop. 144,722. Being mountainous and marshy it is little adapted for cultivation. Its capital, Grosseto, on the Ombrone, is the seat of a bishop, and has a beautiful cathedral. Pop. 9,600.

Grossulaceæ (grō-sū-lā'se-ē), GROSSULARIACEÆ, a tribe of plants of the nat. order Saxifragaceæ, comprehending the gooseberry and currant of gardens, and consisting, in fact, of only one genus, Ribes; they are natives of most parts of the world except Africa and the tropics.

Grosswardein (grōs'vâr-dīn), a royal free city of Hungary, capital of County Bihar, in a beautiful plain, on the Körös. It consists of the town proper, surrounded by walls, and otherwise fortified, and of extensive suburbs, is tolerably well built, and is a railway center. The staple manufacture of the city is earthenware. Pop. 50,177.

Grosvenor Gallery (grō've-nor), a building erected in 1877 by Sir Coutts Lindsay in New Bond Street, London, for annual exhibitions of pictures. In these exhibitions preference has generally been given to certain schools of art, represented by such names as Burne Jones, Rossetti, etc., and in general to work which appeals more to a peculiar æsthetic taste than to the popular mind.

Grote (grōt), GEORGE, an English historian and politician, was born in 1794; died in 1871. His grandfather, descended from German ancestors, was one of the original partners of the London banking-house of Prescott, Grote & Co. Having been educated at Sevenoaks and at the Charterhouse, he entered in 1810 as a clerk in his father's banking establishment. As early at 1823 he began to collect materials for his *History of Greece*. In 1832 he was elected a member of Parliament for the city of London, and his subsequent parliamentary career, until his retirement in 1841, was principally devoted to the advocacy of vote by ballot. He was also a leader of the 'Philosophic Radicals.' In 1846 appeared the first two volumes of his *History of Greece*. The remaining ten volumes followed in rapid succession, the final volume being published in 1856. The work terminates with the death of Alexander the Great, and as a whole is a monument of erudition. In 1865 he published *Plato and the Other Companions of Sokrates*, and was engaged at the time of his death on an elaborate treatise on Aristotle and the Peripatetics. In the latter part of his life he was concerned in the management of University College, the London University, and the British Museum.

Grotesque (grō-tesk'), in art, a capricious variety of arabesque ornamentation, which, as a whole, has no type in nature, the parts of animals, plants, and other incongruous elements being combined together. It was used by the Romans in decorative painting and revived by the artists of the Renaissance.

Grotius (grō'she-us), or DE GROOT, HUGO, a Dutch scholar, born at Delft, 1583. He entered the University of Leyden when only eleven, was a pupil of J. J Scaliger, under whose supervision he edited *Marcianus Capella* and the *Phenomena of Aratus*. In his fifteenth year he was graduated, and in the year after he accompanied the Dutch ambassador to France. Having sided with the party of the Remonstrants, Grotius was condemned to perpetual imprisonment by the opposite and successful party, but he escaped. Louis XIII granted him a pension, subsequently withdrawn. After several vicissitudes he went to Stockholm, entered the service of Queen Christina, and was appointed ambassador to France in 1635. He died in 1645. His greatest work is *De Jure Belli et Pacis* (1625), on the fundamental principles of international law.

Groton (grō'ton), a town of New London Co., Conn., on Thames River, opposite New London. It has shipbuilding yards, etc. At Fort Griswold is a monument in memory of the massacre of the garrison, Sept. 6, 1781, by Benedict Arnold's forces in the Revolutionary war. Pop. (1920) 9227.

Grouchy (grō'shē), EMMANUEL, MARQUIS DE, a noted French general, born at Paris in 1766. He entered the Royal Life Guards at the age of fourteen, saw much service, and highly distinguished himself. In the war with Prussia in 1806, and Russia (1807), and at Wagram, he acquired increased renown. In 1815 he defeated Blücher at Ligny. Having been ordered to follow the Prussian retreat, he failed, through some misapprehension of orders, to aid Napoleon at Waterloo. He was banished under the second restoration, and lived for a few years in Philadelphia. He returned to France in 1821, and died in 1847.

Ground, in painting, the first layer of color. The Italian school preceding and during the time of Raphael employed white grounds, but afterwards, when canvas had superseded panels, the Italian and Spanish schools adopted an oil ground of a dull red color. The Dutch and Flemish masters used light grounds varying from white to gray, and their example has been followed by the English painters and those of the modern European schools.

Ground Dove, a name of various species of pigeons, which resemble the gallinaceous birds in living mainly on the ground, their feet being better suited for walking than perching. The name is especially given to the members of the genus *Chamæpelia*, small birds belonging to the warmer parts of America, and includes the bronze-wing pigeons of Australia. The large pigeons of the genus *Goura* (the crowned pigeons) are also so called. See *Goura*.

Ground-hog. Same as *Aardvark*.

Ground-Ice. See *Anchor-Ice*.

Ground Ivy, *Glechōma hederācĕa*, a common wayside

plant of the order Labiātæ, with a creeping stem and purple flowers. Tea made from it is used by the poor for pectoral complaints. It was formerly employed to flavor ale.

Groundnut, a term which denotes the seeds of pods of the *Arăchis hypogœa*, or the tubers of certain umbellifers (earthnuts). The *Arăchis hypogœa* is a leguminous annual of diffuse habit, with hairy stem, and abruptly pinnate leaflets. The nut or pod is situated at the end of a stalk of some length, and is ripened under ground, this stalk having the peculiarity after flowering of bending down and pushing the fruit into the earth. The plant is extensively cultivated in the United States and in several tropical countries. The nuts have an agreeable flavor and are largely eaten after having been roasted, while they yield an oil that may be used for olive-oil. When ground up finely and mixed with oil, are called *peanut-butter*. See also *Earthnut*.

Ground-pine (*Ajūga Chamœpitys*), a herbaceous labiate plant, so called from its resinous smell. Also a name given to some lycopods or club-mosses.

Ground-rent, is the rent paid to a landowner by a person for the use of ground on which buildings are erected. The usual arrangement is for a specified time. In the United States a ground-rent deed is usually drawn for a term of years, mentioning the consideration-money on which interest is payable.

Groundsel (ground'sel; *Senecio vulgāris*), a European weed belonging to the nat. order Compositæ. The plant is emollient, has a slightly acid taste, but is rejected by almost every quadruped except the hog and goat; cage-birds are fond of the seeds. The Golden Senecio is an American species.

Ground Squirrel, the name of squirrels of the genus *Tamias*, somewhat resembling the marmot. They differ from the common squirrel in possessing cheek-pouches, and in retreating into burrows. They are well known in America, but species are also found in Asia and Africa.

Group Insurance. A new form of mutual social benefit, recently come into use. It is a sort of outgrowth of the workmen's compensation acts, which it has closely followed. The first compensation act was the Federal law of 1908, and the first State act to go into force was the New Jersey one of 1911, while group insurance in America began in 1912. Social insurance was needed in cases where the compensation laws were not operative, as in the case of those dependent on artisans. Some insurance companies are inclined to believe that this form of insurance is likely to take as strong a hold as the compensation laws, and policies of this kind have been bought by some employers on a large scale and presented to their workmen as a way of showing their good will. By the taking out of group insurance, rates may be much reduced as the need of agents is diminished. In an insured group men with slight ailments will be included with those perfectly sound, the insurance companies being confident that men seriously diseased will not be taken into a group. Most group insurance is offered either in the form of single life insurance or with more elaborate policies, as life insurance disability provision, annuities for declining years, etc. We find much larger co-operative insurance bodies abroad than in this country, where there are the Sociétés de Secours Mutuèl which have enrolled over 4,000,000 people in France and a half million in Belgium. Here workmen of foreign birth are too much inclined to change employment, but the introduction of group insurance has tended to check this habit.

Grouse (grous), the general name of the gallinaceous birds of the family Tetraonidæ, whose distinguishing mark is a naked band, often of a red color, in place of an eyebrow. They are wild, shy, and almost untamable. They live in families, in forests and barren regions, and feed on berries, buds, and leaves. They are polygamous, the male abandoning the female, and leaving to her the whole care of the progeny. The eggs number eight to fourteen. The largest species is the *capercailzie* or *wood grouse*. (See *Capercailzie*.) Other species are the black grouse, the red grouse, commonly called simply the grouse, and the white grouse or ptarmigan. The black grouse (*Tetrão tetrix*) is about the size of a common fowl. The male has the outer feathers of the tail curved outwards, so that the tail is lyre-shaped. It chiefly lives in high and wooded situations, feeding on various kinds of berries. The female is commonly called *gray hen*. To this genus belong several species peculiar to North America, the most remarkable of which is the *pinnated grouse* or prairie hen (*T. cupīdo*), which inhabits open desert plains in particular districts of the United States. The male is furnished with wing-like appendages to his neck, covering two

loose, orange sacs, capable of being inflated. Another species is the *cock of the plains* (which see). The grouse with hairy feet and which undergo seasonal change of plumage form the genus *Lagōpus*. Of these the *red grouse* (*Lagōpus scoticus*) is the most important. This bird, also called *moorfowl*, is found in great plenty in the Highlands of Scotland, also in Wales, the north of England, Ireland, and the Scottish islands. It pairs in the spring; the female lays eight or ten eggs. As soon as the young have attained their full size they unite in flocks of forty or fifty, and are extremely shy and wild. This bird attracts large numbers of sportsmen every August to the Scottish moors to take part in the grand sporting campaign which follows 'the twelfth.' The *ptarmigan* or *white grouse* (*Lagōpus mutus* or *vulgāris*) is ash-colored in summer, but its hue changes to a pure white in winter. It is found in Scotland and in most northern regions, inhabiting the tops of mountains. See also *Hazel Grouse, Ruffed Grouse, Sand Grouse.*

Grove (grōv), Sir George, an English writer, born in 1820; died in 1900. He was educated as a civil engineer, in which capacity he was connected with the Britannia Bridge and other important works. He was long secretary to the Crystal Palace Co., and did much for the popularizing of classical music in connection with its concerts. For some years he edited *Macmillan's Magazine*, and he was editor of, and a contributor to, the great *Dictionary of Music*, published in 1878-1889. He was also an extensive contributor to Smith's *Dictionary of the Bible.* He was knighted in 1883.

Grove, Sir William Robert, physicist, born at Swansea, Wales, in 1811; died at London in 1896. He was graduated from Oxford in 1835 and became successful as a lawyer, meanwhile devoting himself to the study of physical science, in which he made important discoveries. About 1839 he invented the useful nitric-acid voltaic battery which bears his name.

Grove City, a borough of Mercer Co., Pa., 70 miles N. of Pittsburgh. It is the seat of Grove City College, established 1884; and has varied manufactures. Pop. 5000.

Grow (grō), Galusha A., statesman, was born in Windham County, Connecticut, in 1824, removing to Pennsylvania in 1834. In 1850 he was elected to Congress, serving for twelve years, and was elected Speaker of the House in 1861. He rendered important services in Congress, and was a strong advocate of the Homestead bill. He returned to Congress in 1894, and died in 1907.

Grub, the term applied to the soft, wormlike larvæ of coleopterous and other insects. Some species do much injury to the roots of plants, growing corn, etc.

Grünberg (grün'berh), a town in the Prussian government of Liegnitz, Silesia, surrounded by vineyards, which produce large quantities of wine. Pop. 23,162.

Grundtvig (grön'vig), Nikolai Frederik Severin (1783–1872), Danish poet and theologian, born at Udby, in Zealand, became known as the author of *Northern Mythology* (1808) and *Decline of the Heroic Age in the North* (1809). These were followed by the *Rhyme of Roeskilde*, the *Roeskilde Saga*, and patriotic songs. He became the head of a religious school, the Grundtvigians, who strove to free the church from the interference of the state. From 1839 Grundtvig preached in the Church of Vartov Hospital in Copenhagen; after 1861 with the title of bishop. His son published his *Poetiske Skrifter* (6 vols.) in 1880–85.

Grundy, Mrs., an imaginative character in the English comedy *Speed the Plough*, in which *Dame Ashfield* is troubled about the opinion of her neighbor on some topic and asks anxiously, 'What will Mrs. Grundy say?' Since then Mrs. Grundy represents the general opinion of the public on any mooted question, and is a synonym for common gossip.

Grunt, Grunter, an American fish of the family Hæmulonidæ, also termed *pig-fish* and *red-mouth*. The first of these names relates to the sound it emits when taken out of the water, the last to blood-red marks on the gums or lips. The Growler, found in America, also emits a grunting sound.

Gruyère (grü-yär), a village, Switzerland, canton and 16 miles south of Fribourg, on a hill crowned by a fine old feudal castle. It gives its name to the well-known cheese made from a mixture of goats' and ewes' milk. It is firm and dry, and possesses cells of considerable magnitude.

Gryllus (gril'us), a genus of orthopterous insects, embracing the house and field crickets, though some also include in it the grasshopper.

Grysbok (griz'bok, 'grey buck'; *Antilope melanōtis*, or *Calotragus melanōtis*), a species of antelope found in Southern Africa. It attains about 3 feet in length, is 1½ feet high at the shoulder, and its color is reddish-

grey. It is hunted for the sake of its flesh.

Guacharo (gwä-chä'rō; *Steatornis Caripensis*), a bird of the goat-sucker family, of nocturnal habits, a native of South America, and found in great numbers in certain caves of Venezuela, Trinidad, and elsewhere. It is about the size of a common fowl, with a curved and toothed bill, wings long and pointed. Their food is principally fruits, upon which they grow so fat that the Indians destroy great numbers for the sake of their oil or clarified fat, which is transparent, inodorous, and keeps long without becoming rancid. It is called also *Oil-bird.*

Guadalajara (gwä-*dä*-lä-*hä'*rä), a town of Spain, capital of the province of same name, on the Henares, 44 miles northeast of Madrid. It is substantially built, with manufactures of woolens, soap, earthenware, etc. Pop. 11,144.—The province, area 4676 square miles, is mountainous, or rather forms part of an elevated plateau. Pop. 200,186.

Guadalajara, a city of Mexico, capital of the state of Jalisco, in the fruitful valley of Atemajac, on the Rio de Santiago; a large and handsome city, with a fine cathedral (being an archbishop's see), and other good buildings; a university, a mint, convents, etc. Various manufactures are carried on, as those of silversmiths' and goldsmiths' wares, paper, leather, hats, pottery, cloth, etc. Pop. 101,208.

Guadalquivir (gą-d a l-k w i v'ėr; Span., gwä-*dal*-ke-vēr'), a river of Spain, which rises in the frontiers of Murcia, traverses Andalusia from northeast to southwest, passing the towns of Cordova and Seville, and thereafter flowing S. S. W., falls into the Atlantic. Its course is 250 miles, of which 70 miles are navigable. It abounds with fish.

Guadeloupe (gą-de-löp), one of the French West Indies, composed of two portions, separated by a narrow arm of the sea called Rivière Salée (salt river). The western and larger portion is Basse-terre, or Guadeloupe proper, 27 miles long by about 15 miles broad. The eastern portion, called Grande-terre, is nearly 30 miles long by 10 to 12 miles broad. Guadeloupe proper is of volcanic formation, the culminating point being La Soufrière, 5018 feet. Grande-terre, on the other hand, is generally flat, and of coral formation. Guadeloupe is watered by a number of small streams which become dry in summer. Grande-terre has only a few springs of brackish, undrinkable water. The climate is hot and unhealthy, with a remarkably humid atmosphere, and hurricanes are frequent and destructive. The soil is fertile. The chief exports are sugar, coffee, dye and cabinet woods, pepper, manioc, tobacco, etc. The chief town is Basse-terre. Pop. 134,000, or with dependencies (Marie Galante, Desirade, etc.), 182,112.

Guadiana (gwä-*di*-ä'nä), a river of Spain, which rises in New Castile, flows first northwest, then southwest into Estremadura, and on reaching Badajoz begins to form part of the boundary between Spain and Portugal. Entering that kingdom, it finally falls into the Atlantic after a course of 400 miles, of which only 35 are navigable.

Guadix (gwä-*dēh'*), a town of Southern Spain, Andalusia, in the province and 31 miles E. N. E. of Granada. Said to be the first bishop's see erected in Spain, with a handsome cathedral, and a finely situated old castle, almost in ruins. Pop. 11,300.

Guaduas (gwä'dwäs), a town, republic of Colombia, remarkable as being one of the most elevated places on the globe, being 8700 feet above sea-level. Pop. 9000.

Guaiacum (gwī'a-kum), a genus of plants, belonging to the natural order *Zygophyllaceæ*, and containing four or five arborescent species, natives of the West Indies and the tropical parts of America. *G. officināle* has wood that is exceedingly hard, of a pale yellow color near the exterior, and blackish brown at the heart, heavier than water, and well known under the name of *lignum vitæ*. Among other uses it is employed in the construction of ornamental articles of furniture, being susceptible of a fine polish. This tree yields the resin known as guaiacum, which either flows spontaneously from the tree, or from incisions or perforations in the stem, or is got by extraction by means of spirit from the wood. It is greenish-brown, has a balsamic odor, taste somewhat bitter and pungent, and it dissolves freely in spirit, but is insoluble in water. Its chief use is in medicine, the resin (as well as a decoction of the bark and wood) acting as a stimulant in chronic rheuma-

Guaiacum Plant (*Guaiacum officināle*).

tism, and being used also in gout, scrofula, syphilis, etc.

Gualeguay (gwäl'e-gwī), a town of the Argentine Republic, prov. Entre Rios, on river of same name. Pop. 9000.

Gualegwaychu (g w ä-l e-gwī-chō'), a town of the Argentine Republic. Pop. 15,000.

Guam (gwäm), GUAHAN, GUAJAN or SAN JUAN, the largest of the Ladrone Islands, acquired from Spain by the United States after the Spanish-American war. It lies in the North Pacific Ocean, lat. 13° 30′ N., long. 145° E. It has an area of about 200 square miles, is mountainous in the south; low and of coral formation in the north. The chief ports are Agana (the capital) and San Luis de Apra. The island is well wooded, the soil, fertile. Bread-fruit, cocoanut, rice, sugar and indigo are cultivated. Pop. about 13,000.

Guan (gō'an), a gallinaceous bird of the family Cracidæ, genus *Penelopē*. The sides of the head and front of the throat are naked and wattled. The guans are natives of South America.

Guanabacoa (g w ä'n ä-b ä-k ō'ä), a town of Cuba, lying in a small fertile plain among rocky hills, five miles east of Havana. Pop. about 15,000.

Guanaco (gwän-ä'kō), *Auchenia huanacus*, a South American ruminant, closely akin to the llama, alpaca, etc. It is believed to have been the progenitor of the domesticated llama and alpaca.

Guanajay (gwä-nä-hī), a town of Pinar del Rio province, Cuba, 33 miles w. s. w. of Havana and a few miles from the coast. Pop. 10,000.

Guanajuato (g w ä-n ä-*ɥ* w ä't ō), a city of Mexico, capital of the state of the same name, 160 miles northwest of Mexico, is situated in a narrow defile, hemmed in by mountains, at the height of 6800 feet above the sea, with steep irregular streets, but well-built houses. Pop. 35,147.—The state is situated in the center of Mexico; area, 11,411 square miles; pop. (1910), 1,075,270. Its mines, once the richest in the world, still yield a large amount of gold and silver. The surface is traversed by the Cordillera of Anahuac, 7000 feet high.

Guanches (gu-ân'chez), the aborigines of the Canary Islands, long ago extinct as a separate nation, although Guanche blood probably flows in the veins of many of the present inhabitants. They possessed high moral and physical qualities. They practised the embalming of the dead. The few words of their language which remain seem cognate to the Berber tongue.

Guano (gwa'-nō; Peruvian *huano*, dung), a valuable manure, consisting of the partially decomposed and dry excrement of fish-eating sea-birds, which has in some places accumulated in great masses. The name has been also extended to accumulations of a similar kind from land birds, and even from bats in caverns. Owing to the fact that rain washes such deposits away, great accumulations of guano exist principally in hot and dry tropical regions. The most important of all were the deposits on the Chincha Islands off the coast of Peru, which yielded a considerable revenue to the country, but are now quite exhausted. From 1853 to 1872 about 8,000,000 tons were got from these islands. The guano which was found there was from 60 to 80 or 100 ft. in thickness, and was entirely due to the droppings, accumulated for many ages, of the innumerable sea-birds which make these islands their resting-place and breeding-ground. Other deposits of less extent have from time to time been found, and Peru still remains the chief source of supply, its deposits being now, however, worked under the Chilean government. Guano varies extremely in composition, but it may be roughly divided into nitrogenous and phosphatic. The first of these contains about 21 per cent. of ammonia. This is the case with the Peruvian variety, which contains almost all the inorganic matter required by a plant, and that in a highly available form, so that it is looked upon as one of the best of all fertilizing agents for different crops. Its use as a manure was known to the native Peruvians centuries ago, but no attention was paid to the accounts by modern travellers of its wonderful efficacy until A. von Humboldt brought some to Europe and had it analyzed. It began to be brought to Europe about 1846. It is used raw or in its natural state, but most of the phosphatic guanos (some of which hardly deserve the name of guano) require to be dissolved by sulphuric acid before using. There are also manures known as *fish guano*, prepared from fish or fish refuse, *flesh guano*, *blood guano*, etc. Large quantities of fish guano are made in the United States, the menhaden being the fish used, and the oil being extracted before the fish are ready for conversion into manure. Fish guano is also at the present time largely made in Europe. It is an excellent substitute for the natural guano.

Guantanamo (gwän-tä'nä-mō), or SANTA CATALINA DEL SALTADERO, a town of Santiago de Cuba province, Cuba, 33 miles E. N. E. of Santiago de Cuba (direct). It has railroad connection with the sea and is in the midst of an extensive coffee-growing district. Guantanamo Bay is an American naval station. Pop. about 8000.

Guapore (gwâ-pō'rā), or ITENEZ, a river of South America, which rises in the Brazilian province of Matto Grosso, and after a varied course of about 500 miles, unites with the Mamoré in forming the Madeira.

Guarana (gwâ-rä'nâ), or BRAZILIAN COCOA, the seeds of the *Paulinia sorbilis*, a South American tree. It is extensively used as a beverage and contains twice as large a proportion of caffeine as coffee.

Guarani (gwä-rä-nē'), tribe of aborigines, once spread widely through central and southern Brazil, Paraguay, Bolivia, Argentina, and Uruguay. Their migratory movements, the most widespread among South American aborigines, were peaceful, and, including the kindred Tupi, they may be said to have comprised the major part of the eastern Amazons.

Guarantee (gar-an-tē'), in law, an undertaking by which a person binds himself to answer for the failure of another. In the United States no person is liable on any special promise to answer for the debt, default, or miscarriage of another person, unless a written agreement, or some memorandum in writing for such purpose, shall be signed by the promiser or some other party lawfully authorized by him. It is a general rule that the surety shall not be bound beyond the express words of the engagement.

Guardafui (gwâr-dâ-fwē'), CAPE, or RAS JERDAFOON, the most Eastern point of Africa, at the entrance of the Gulf of Aden, a frequent scene of shipwreck.

Guardian (gar'dyan), in law, the custodian of persons incapable of directing themselves, and especially of infants, that is, persons under 21 years of age. He is entitled to the care and custody of the person of his ward. If he spends more than the interests and profits of the estate in the maintenance and education of the ward, without permission of court he may be held liable for the principal thus consumed. Guardianship lasts until the ward has attained the age of twenty-one. Trust companies have now largely entered into the business of guardianship, a custom which adds greatly to the safety with which estates are handled.

Guardian Angel, the angelic guardian who, by some, is supposed to watch over every human being with a view of preserving him or her from moral evil. The notion is based on Gen. xlviii, 16; Matt. xviii, 10, and Heb. i, 14.

Guardians of the Poor, in England, persons elected by a parish or union to manage the affairs of the poor. Each ratepayer has one or more votes in proportion to his property, the maximum being twelve. The guardians have the management of the workhouse, and the maintenance, clothing, and relief of the poor.

Guards (gardz), troops whose duty is to defend the person of a ruler. In modern times the term *guard* has been used to designate corps distinguished from the troops of the line by superior character, or only by rank and dress. Among the most famous guards were those of the rulers of France. The Scottish Guards of Charles VII (see *Garde Ecossaise*) and the Swiss Guards (see *Gardes Suisses*), enrolled by Louis XIV, have acquired historical importance. Under the latter monarch the Royal Guard amounted to 10,000 men. In 1789, when the revolution began, all the branches of the guards amounted to about 8000 men. The Imperial Guard was formed by Napoleon I in 1804, and in 1812 it amounted to 56,000 men. His guards were almost completely annihilated at Waterloo. The Imperial Guard was revived by Napoleon III in 1854, and took part in the Crimean war; but in the Franco-German war of 1870-71 its career was closed at the surrender of Metz. The guards of Frederick the Great of Prussia were of distinguished courage and remarkable height. The German guard now forms a complete army corps, and one of the finest bodies of troops in Europe. In England the guards, otherwise called the household troops, consist of the Life Guards (1st and 2d), the Royal Regiment of Horse Guards, and three regiments of foot guards, namely, the Grenadier Guards, the Coldstream Guards, and the Scots Fusilier Guards. The 1st and 2d Life Guards, and the Royal Horse Guards stand at the head of the cavalry of the country as the three regiments of foot guards do of the infantry. In time of peace they constitute the garrison of London and the guard of the sovereign at Windsor.

Guard-ship, a vessel of war appointed to superintend the marine affairs in a harbor, and to visit every night the ships of war which are not commissioned; she also acts as a depot for seamen raised in the port until appropriated to other vessels.

Guarini (gwâ-rē'nē), GIOVANNI BATTISTA, an Italian poet, was born at Ferrara in 1537; and died in 1612. After having studied at Ferrara, Pisa, and Padua, and lectured in his native city on Aristotle, he entered the service of Duke Alphonso II of Ferrara, who sent him on various important missions. Having lost the favor of the prince, he retired into private life, but was recalled in 1585 to the office of secretary of state. Two years after he retired a second time. In 1597 he entered the service of Ferdinand I, grand-duke of Tuscany, which he soon quitted. His propensity to litigiousness necessitated his residence at Venice, Padua, and Rome. In 1605 he went as an ambassador of his native city to the court of Rome, to congratulate Paul V on his elevation. He died at Venice. Guarini is one of the most elegant authors of Italy, as is especially shown in his *Pastor Fido* ('Faithful Shepherd'), a famous pastoral drama.

Guarneri (gwâr-nā'rē), the name of an Italian family belonging to Cremona, distinguished for its skill in violin-making. The most celebrated of the family was Giuseppe, whose best instruments belong to the years 1690-1707.

Guastalla (gwâs-tâl'lâ), a small town of N. Italy, near the Po, which, in the sixteenth century, gave its name to the dominion of the Gonzagas, dukes of Mantua.

Guatemala (gwâ-te-mä'lâ), a republic of Central America; area estimated at 48,290 square miles; population, 2,119,000. It is in general exceedingly picturesque, and distinguished by a luxuriant and varied vegetation. It is wholly mountainous or elevated, the main chain of the continuation of the Andes traversing it southeast to northwest, and sending off numerous branches. Along the main chain are a considerable number of volcanoes, several of which are said to be active—as Fuego and Agua (14,890 feet high), which sends forth torrents of water. The state is well watered by numerous streams, none of much importance. There are several lakes, the most important being Dulce, through which a great part of the foreign trade of the state is carried on; Amatitlan, Atitlan, and Peten. On the tableland, of which a considerable portion of the state is formed, the climate is mild; but in more elevated situations the cold is intense. There is much valuable timber. The soil generally is of great fertility, producing according to altitude, soil, etc., maize, wheat, rice, coffee, cotton, tobacco, sugar, cochineal, cacao, indigo, vegetables, and tropical fruits in great variety. Fibre plants are numerous, including ramie, henequen, and others. The most important product is coffee, and the other chief exports are skins, caoutchouc, cochineal, wool, etc. The trade is chiefly carried on with Britain and the United States. In the *altos* or mountainous parts of the northwest considerable flocks of sheep are raised, the wool of which is manufactured into coarse fabrics. But the manufacturing industries are very insignificant, and trade is hindered by the paucity of roads and railways. Only about a third of the population are of European or mixed descent, the rest being Indians of the Aztec, Toltec or Maya races, mostly speaking their own native tongue. Numbers of the Indians are still quite uncivilized. Great attention is now being paid to education, the children, even Indians, in small and remote villages being compelled to attend school. The capital is Guatemala la Nueva (New Guatemala). The chief port is San José on the Pacific; Champerico on the Pacific, and Livingston in the Bay of Honduras are the other ports. The legislative power is vested in a national assembly elected for six years by universal suffrage. The executive is vested in a president, elected for four years. GUATEMALA CITY, the capital of the republic, is situated about 5000 feet above the sea and had a population of 120,000 in 1916. It was almost completely destroyed by a series of earthquakes that occurred in December, 1917, and January, 1918. The first capital of the country—now known as Ciudad Viega—was overwhelmed by a volcanic eruption in 1556. The second capital, Guatemala la Antigua, was situated about 25 miles west of the present capital. It was destroyed by an earthquake shock in 1774, but was rebuilt and now has a population of about 7000. It is locally celebrated for its thermal springs.

Guava (gwä'va), the popular name for plants of the tropical genus *Psidium* of the nat. order Myrtaceæ. *P. Guaiava* (the guava tree) is a small tree, with square branches, egg-shaped leaves, and large white axillary flowers, which are succeeded by fleshy berries, which are either apple or pear shaped in the two principal varieties. The pulp is of an agreeable flavor, and

of this fruit is made a delicious and well-known jelly. There is also a product called guava cheese.

Guaviare (gwä-vi-ä′rā), a river of Colombia, an affluent of the Orinoco; length, 900 miles.

Guayaquil (gwī-ä-kēl′), a city and seaport of Ecuador, on the Guayaquil, here about 2 miles wide, some 40 miles above its mouth in the Gulf of Guayaquil. Behind the town is an extensive marsh, which renders it unhealthy. There is also a deficiency of water, but the town is improving, and has already street cars and telephones. It is the chief port of Ecuador, and one of the best on the west coast of South America. Its principal exports are cacao (to the value sometimes of $5,000,000), coffee and ivory-nuts. Pop. estimated at 80,000.

Guayra (gwī′rä), La, a seaport in Venezuela, closely surrounded by mountains and precipices. It carries on a considerable trade, and exports coffee, cacao, etc. Pop. about 12,000.

Gubbio (gụb′i-ō; ancient *Iguvium*), a town in Italy, in the province of Umbria. It is a bishop's see, and has manufactures of silk and woolen stuffs. Here were discovered the Eugubine Tables (which see) in 1444. Pop. 5540.

Guben (gö′ben), a town in Prussia, province of Brandenburg. Brewing, dyeing, and tanning are carried on, and there are manufactures of woolen and linen cloth, tobacco, etc. Pop. 36,666.

Gudgeon (guj′un; *Gobio*), a fresh-water fish, belonging to the carp family (Cyprinidæ). It has short dorsal and anal fins, without spines; on each side of the mouth there is a small barbel; neither jaw is furnished with teeth, but, at the entrance of the throat, there are two triangular bones that perform the office of grinders. These fish are taken in gentle streams, and measure only about 6 inches.

Gudrun (gụd′rụn), a celebrated German popular epic belonging to the end of the twelfth century, receiving its name from its heroine Gudrun, daughter of King Hettel of Hegelingen. Hettel is defeated by Hartmut, son of King Louis of Normandy, who carries Gudrun off, and on her steadfast refusal to marry him, has her subjected to various kinds of ill treatment, and in particular lets his mother keep her for years engaged in the lowest kinds of drudgery. At last she is released and revenged by her brother and her betrothed, King Herwig of Seeland. The poem also deals with the fortunes of Gudrun's father and mother, grandfather and grandmother, etc., and the scene is partly in North Germany, Denmark, Friesland, partly in Ireland and Normandy.

Guebres, Guebers (gē′bėrz), a name given to the fire-worshippers of Persia, represented in India by the Parsees. The original Guebres or followers of Zoroaster are now represented almost solely by those who inhabit the cities of Yezd and Kirman and the adjoining villages. At present they number only about 7000. As supreme deity they recognize Ahuramazda, or Ormuzd, the principle of light and source of all that is good; and his opposite and antagonist, the evil principle, the latter called Ahriman. They believe in the existence of heaven and hell, between which stretches the Bridge of the Gatherer or Judge; over this none but the righteous may pass. Among their leading practices may be mentioned their refusal to contract marriages with those of other creeds; their objection to eat beef or pork, or to partake of anything cooked by one of another religion, etc. They regard Ahuramazda as the source of light, and in their temples they feed the altars with perpetual fire, and hence their name fire-worshippers; but they do not revere it except as a symbol of the deity. When, in 651 A. D., Yezdegird, the last of the Sassanides, was defeated by the Caliph Omar, the majority of the Persians embraced Islamism. Those who continued Zoroastrians received the name of Guebres or infidels, and were subjected to persecutions so severe that the majority emigrated to India, where they became known as Parsees. See *Parsees.*

Guelderland (gel′dėr-lant). See *Gelderland.*

Guelder Rose (gel′der), or Guelders Rose, a name given to the cultivated variety of the *Viburnum Opulus,* or water elder, of the order Caprifoliaceæ. On account of the shape and color of its flowers it is sometimes called the Snowball Tree. Its fruit is of a pretty red color.

Guelf (gwelf), or Guelph, the name of a distinguished princely family which originated in Germany, but was also at one time connected with Italy, and which still flourishes in the two lines of the house of Brunswick, the royal (to which the reigning family in Britain belongs) and the ducal. The first who bore the name is said to have been Welf, the son of Isenbrand, whose grandfather was a vassal of Charlemagne. See *Brunswick* (Family of) and *Guelfs and Ghibellines.*

Guelfs and Ghibellines, names of two great Italian political parties in the 13th and 14th centuries. The names are derived from the Italian *Guelfi* and *Ghibellini*, which are corrupted from the German *Welfen* and *Waiblingen*. These latter words came to be used as party designations in Germany, in the war between Henry the Proud and Conrad of Hohenstaufen, to whom belonged the estate of Waiblingen in Würtemberg. About the year 1200 the designations Guelf and Ghibelline came to be employed to denote respectively the Italian patriotic and papal party, and the party which supported the domination of the German emperors in Italy. After the fall of the Hohenstaufen the Ghibellines became the partisans of aristocracy, and the Guelfs the partisans of democracy and liberty; but the designations ultimately denoted mere communal and family feuds, and Dante, originally a Guelf, but subsequently a Ghibelline, asserted that the two parties were the cause of all the miseries of Italy. The contest continued with bitterness for almost three hundred years. Corresponding parties appeared in Italy under many different names, as the *bianchi* and *neri* (white and black) in Florence, etc.

Guelph (gwelf), a town of Canada, province Ontario, in a rich farming district, 45 miles W. of Toronto, with manufactures of woolens, sewing-machines, and agricultural implements, and a model farm kept up by the provincial government. Pop. (1911) 15,148.

Guercino (gwer-chē'nō). See *Barbieri.*

Guereza, or GUERZA (ger'e-za, ger'za; *Colobus guerza*), a species of monkey remarkable for its beauty, inhabiting the mountains of Abyssinia. Short, glossy, jet-black fur covers its limbs, back, and head, while a long fringe of silky white hair depends from the flanks. It frequents lofty trees.

Guericke (ger'ik-e), OTTO VON, a German physicist, born at Magdeburg (of which he became burgomaster or mayor) in 1602; died at Hamburg in 1686. About 1650 he invented the air-pump, with which he made public experiments at the diet at Ratisbon, before the Emperor Ferdinand III. His most important observations, collected by himself, appeared at Amsterdam in folio (in 1672).

Guérin (gā-răn), JEAN BAPTISTE PAULIN, a French painter, born at Toulon in 1783; died at Paris in 1855. He painted portraits and historical subjects. His chief pictures are the following: *Cain After the Death of Abel, The Dead Christ, Adam and Eve Driven Out of Paradise, Anne of Austria and Her Sons*, etc.

Guernsey (gêrn'zi), the second largest and most western of the Channel Islands, lying off the north coast of France, 46 miles from Cherbourg, and about 68 miles from Start Point in Devonshire. It is of a triangular form, about 9 miles long, and 3 to 4 miles broad. The northern part is level, the southern more elevated, coast lofty and abrupt, the island being almost entirely of granite formation. The climate is extremely healthy; snow is rare, and frosts light and of short continuance. The soil is fertile. The breeding of cattle and the dairy are the principal objects of attention; and the butter made is highly esteemed. Horticulture and floriculture also receive much attention, and fruit, especially figs and grapes (the latter grown under glass), is very abundant. The grape-houses are further utilized for the raising of early vegetables and tomatoes, which are sent to the London market. The principal exports are cattle (the dairy cows being renowned), fruits, vegetables in the early spring; granite for paving, etc. The dialect of the island is the pure Norman of some centuries ago; but a knowledge of English is general. The principal place of education is Elizabeth College, at St. Peter's Port, the capital, and only town in the island. Steamers ply regularly between Guernsey and London, Southampton, Plymouth, and Weymouth. The island is under a lieutenant-governor, who represents the sovereign in the assembly of the states, a kind of local parliament. It is strongly fortified, and has a well-organized militia. Pop. 40,477. See *Channel Islands.*

Guernsey Lily, *Nerinē Sarniensis*, a beautiful plant, with purple red flowers, native of South Africa, family Amaryllidaceæ, so called from some of its bulbs being cast up in Guernsey from a wrecked ship and there taking root. There are several other species also called Guernsey lilies.

Guerrero (ger-rā'rō), a state of Mexico; area, 24,227 sq. miles. Its surface is finely diversified by mountain and valley, and partly covered by native forests; and it is rich in minerals, including gold, silver, copper, and iron. The principal port is Acapulco. Pop. 479,205, mostly Indians.

Guerrillas (ge-ril'az; in Spanish ge-ril'yâs), a name first given in Spain to light, irregular troops, consisting chiefly of peasants who fought against the invading French in the early

part of the present century. The name has now become quite a general term for such irregular troops, and has traveled far beyond Spain, reaching pretty much the entire world.

Guesclin, BERTRAND DU. See *Du Guesclin.*

Guest (gest), EDGAR ALBERT (1881-), an American poet and humorist, born in Birmingham, England. He removed to the United States in 1891 and was educated at the grammar and high schools of Detroit. Joining the staff of the Detroit *Free Press*, he developed a style of humorous writing and easy verse that gained him popularity. He conducted a column for the *Free Press* and wrote much verse, which was published in numerous newspapers and later appeared in book form under the titles *Just Folks, A Heap o' Livin', Over Here, Path to Home.*

Gueux (*gœ;* Fr. 'beggars'), a name given in derision to the allied nobles and other malcontents in the Netherlands, who resisted the despotism of Philip II, in 1566-67. The Count of Barlaimont having termed the malcontents *Gueux*, they adopted the name, and a suitable badge called the 'beggar's denier.' They were totally dispersed in 1567.

Guevara y Dueñas (gā-vä'rä ē dụ-en'yäs), LUIS VELEZ DE, a Spanish dramatic poet, born in 1570; died in 1644. His literary fame rests chiefly on his *Diablo Cojuelo* ('Lame Devil'), which suggested the famous *Diable Boiteux* of Le Sage.

Guggenheim (gug'en-hīm), the name of a family of American capitalists, notable in connection with the copper mining industry. Among the sons of Meyer and Barbara (Myers) G. Guggenheim have been Benjamin (1855-1912), who had charge of the first smelter built by his family at Pueblo, Colorado, and who was drowned on the *Titanic;* Simon (1867-), who was elected United States senator from Colorado in 1907; Daniel, Isaac, Murry (Morris), Solomon R., and William.

Guglielmi (gụl-yel'mē), PIETRO, an Italian composer, born 1727; died 1804. He composed comic and heroic operas for the Italian theatre, visited Vienna, Madrid, and London, and afterwards returned to Naples, where he became the rival of Paesiello. In 1793 Pius VI named him chapel-master of St. Peter's. He left more than 200 pieces, remarkable for their simple and beautiful airs, their rich harmony, and originality.

Guiana (gī-an'a), BRITISH, a colony in the north of South America, about 560 miles long and 200 miles broad, bounded E. by Dutch Guiana, W. by Venezuela and Brazil, N. and N. E. by the Atlantic, and S. by Brazil; estimated area 89,480 sq. miles. It is divided into three settlements—Berbice, Demerara, and Essequibo. The coast tract forms a dreary belt, 10 to 40 miles broad, of mud-banks and shallows, and when drained the surface sinks 1 foot below the sea-level, hence strict attention must be paid to dams and sluices. This alluvial deposit is succeeded by a range of low hills not exceeding 200 feet in height. The interior is traversed in various directions by chains of hills or mountains. On the western boundary is the singular flat-topped and almost inaccessible mountain Boraima, rising to a height of 8600 feet. The remaining mountains do not reach more than 4000 feet elevation. The most valuable mineral product is gold, the mining of which has been active since 1886. Diamonds are also found. The chief rivers are the Essequibo, Demerara, Berbice, and Corentyn. The climate, though moist and warm, is not on the whole unhealthy. Cultivation is confined to the coast region; the soil is very fertile, and much of it well adapted for the sugar-cane, the cultivation of which is mostly carried on by Indian and Chinese coolies. Guiana also produces coffee, tobacco, indigo, etc. Vegetation is singularly luxuriant, and the forest-trees are of the most magnificent description. Fruits, medicinal plants, fibrous vegetables, dyeing woods, etc., abound. The flora includes the *Victoria Regia*, the largest of the water-lilies. Among the animals are the jaguar, tapir, armadillo, sloth, vampire bat, alligator, etc., and many species of birds, such as hummingbirds, parrots, etc. Snakes, some of them venomous, and troublesome insects are numerous. Guiana has two dry and two wet seasons, each continuing for three months: December, January, February, June, July, and August, constitute the wet season, the other months of the year the dry. The mean annual temperature is nearly 81° 2′. Violent thunderstorms occur at the change of the seasons; but the hurricanes, so destructive in the West Indies, are unknown. The trade is concentrated mainly in Georgetown, the capital. Sugar, rum, and molasses are the principal exports. Guiana was first settled by the Dutch about 1580. It was taken by the British in 1783, in 1796, and again in 1803, and later it was definitely given up to them. Pop. 305,991.

Guiana, DUTCH, or SURINAM, a Dutch colony in South America, situated between English and French Guiana; area, about 46,060 square miles. The general aspect is the same with that of British Guiana—flat and

ST. MICHAEL AND THE DRAGON
Painted by Guido Reni.

swampy on the coast, and mountainous in the interior; well watered by numerous streams, and of which the Surinam and its affluents are the chief. It has also a similarly warm, moist climate, and is very fertile. Only a small part of the colony is under cultivation, the products being similar to those of British Guiana. On the Surinam River, about 10 miles from its mouth, is situated the capital, Paramaribo. The principal exports are sugar, coffee, molasses, and rum. The gold washings are of considerable value and crushing plants have been introduced. The government is vested in a governor-general and council. Pop. 84,103.

Guiana, FRENCH, a French colony in South America, between Dutch Guiana and Brazil; area, about 35,000 square miles. This territory resembles British Guiana in its physical features, climate, and vegetable productions, with the addition, in the latter case, of pepper, cloves, cinnamon, nutmeg, etc. The colony comprises the island of Cayenne, celebrated for the pepper bearing that name. Gold has also been found in considerable quantities, and of late gold washing has been the chief industry and has proved very profitable, the annual yield being nearly $2,500,000. The French are said to have first settled in Cayenne in 1604. Pop. 32,908.

Guiana Bark, the bark of *Portlandia hexandra*, order Cinchonaceæ, considered to possess great value as a febrifuge.

Guicciardini (gwē-chär-dē'nē), FRANCESCO, an Italian historian, born at Florence in 1482; died in 1540. He became professor of jurisprudence at Florence, and held various public appointments. He began in 1534 his famous History of Italy—*Dell' Istoria d' Italia*—which embraces the period 1490-1534. It has been translated into English.

Guicowar's Dominion (gī-ko-wär'). See *Baroda*.

Guides (gīdz), in an army, persons selected for their acquaintance with the topography of the place in which the army operates, and employed to conduct the army or detachments of it to any place which has to be reached. The name of 'guides' is sometimes given to troops without any very specific meaning. In the Indian army it is given to a regiment of cavalry and infantry attached to the Punjab Frontier Force.

Guido Aretino (gwē'dō ä-re-tē'nō), or GUIDO D' AREZZO, an Italian monk, celebrated for his skill in music, flourished in the eleventh century. He was a native of Arezzo, became a Benedictine monk, and finally prior of Avellana, where he died in 1050. He invented the musical staff of lines and spaces (or at least systematized their use), and he introduced the names of the first six notes of the scale, *ut, re, mi, fa, sol, le.*

Guidon (gī'don), the little flag or standard of a troop of cavalry.

Guido Reni (gwē'dō rā'nē), a celebrated Italian painter, born at Bologna in 1575; died there in 1642. Being the son of a musician, he devoted some time to the study of music, but, as painting seemed his true vocation, he was placed under the tuition of Dionysius Calvaert, and subsequently joined, in his twentieth year, the school of the Caracci. In 1602 he visited Rome, and having seen the paintings of Caravaggio, he imitated his style. At the request of Cardinal Borghese he painted *The Crucifixion of St. Peter* and the *Aurora*. He was also employed by Paul V to paint a chapel on Monte Cavallo, and one in Santa Maria-Maggiore. Guido's paintings are generally considered as belonging to three different periods. His earliest pictures, after the style of Caravaggio and Caracci, display powerful contrasts of light and shade. His second manner exhibits light and agreeable coloring, with little shade. His third period is marked by careless haste. Having quarreled with Cardinal Spinola, the treasurer of Urban VIII, he left Rome and returned to Bologna, but was subsequently recalled. In 1622 he removed to Naples, but, after a brief stay, returned once more to Bologna, never to leave it again. Among his most famous works may be mentioned his *Aurora*, his *Magdalene*, *Michael Vanquishing Satan*, *Lot and his Daughters*, his *Fortune*, etc. Guido was also celebrated in his own day for his etchings, but his works of this class have now sunk very much in value.

Guienne, or GUYENNE (gē-en'), an ancient province of France, now comprising the departments of Gironde, Lot, Lot-et-Garonne, Dordogne, and Aveyron, with part of Landes and of Tarn-et-Garonne. The capital was Bordeaux. It fell into the hands of the English in 1152, was nearly all conquered by Charles V in 1377, reconquered by Henry V and Henry VI, and finally annexed to France in 1453.

Guignet's Green (gē-nyā), a pigment prepared by heating in a reverberatory furnace a mixture of three parts of boracic acid and one of bichromate of potassium, made into a thick paste with water. This color is quite fixed—it does not alter by light

or reagents, and it is quite harmless, so that it forms an excellent substitute for the greens which contain arsenic and copper.

Guild (gild), a society or association for carrying on commerce, a handicraft, or some other undertaking. Such associations are known from very early times in various countries. The societies of tradesmen exclusively authorized to practice their art, and governed by laws of their own, played a very important part in the middle ages. They often formed a bulwark against the oppression of the nobility, and were thus extremely conducive to the growth of municipal and civil liberty. Traces of these trade societies are found in the tenth century. In Milan we find the mechanics united under the name *credentia*. At Florence the trades were federated into twenty-one guilds or *arti*. These originated in 1282, on the overthrow of the nobility, and every candidate for citizenship was obliged to enter some particular guild. Such a step became a necessity at a period in which individual rights, as such, failed to secure respect. The purely Teutonic guilds, although connected with the constitution of the cities, possessed certain peculiarities. In the thirteenth century the German guilds of craftsmen obtained the right of defending by arms their own interests, and became so powerful that persons unconnected with a trade were often glad to attach themselves to them. As illustrations of the manner in which associations originally instituted for defensive purposes became the mainstay of a tyrannical monopoly may be mentioned, the frequent withholding of permission from more than a certain number of master mechanics to reside in one place, the restrictions placed upon particular branches of industry, and upon the free exercise, by each individual, of his trade except under the sanction of the guilds. With the view of destroying the political influence which they had acquired the Emperor Frederick II abolished them by a decree issued in 1240; but the decree remained without effect, as did also the clauses inserted with a similar view into the Golden Bull in 1356, and it was not until the last century that unrestricted freedom to practice any trade was established in the German states. In Austria this was done in 1860, and in 1868 it was done for all the states of the North German Confederation. In Britain trade guilds long possessed an importance which was mainly political. As the right of voting was involved in the membership of a guild, many persons, not mechanics, acquired the rights of 'freemen' by connecting themselves with some body of this kind. These guilds, in England, had no legal right to prevent any man from exercising what trade he pleased. The only restriction on the exercise of trades was the statute of Elizabeth, requiring seven years' apprenticeship. This the courts held to extend to such trades only as were in being at the time of the passing of that statute; but by an act passed in 1835, every kind of restriction on artisans, trades, etc., was abolished. The guilds or companies of the city of London (among the oldest of which are the weavers, founded in 1164; the parish clerks, in 1232; the saddlers, in 1280; the fishmongers, in 1284) are still very important corporations, which give relief to poor and decayed members, and also manage vast funds bequeathed for benevolent purposes. Besides the secular guilds there were from a very early period, in Britain, religious guilds. From the time of Henry II all such guilds were required to have a charter from the crown. In 1388 a return of these guilds was ordered to be made, and it was then found that that of Corpus Christi, York, numbered 14,800 members. The property of the religious guilds was sequestrated in the reign of Henry VIII. In France guild-privileges were sold by the state from the tenth century till the revolution of 1789, but at that date guilds were entirely abolished. This was done also at a later period in Belgium, Holland, Italy, Sweden, and Denmark. Many of the trades-unions have now somewhat of the character of the ancient guilds.

Guildford (gil'furd), a town of England, the county town of Surrey, on the Wey, a well-built and thriving place. It has an iron-foundry, corn, paper, and powder mills, and an important grain market. Pop. (1911) 23,823.

Guildhall (gild'hal), the city hall of London, Cheapside, first built in 1411, all but consumed in the great fire of 1666; and in 1669 rebuilt. The front was not erected until 1789. The most remarkable room is the hall, 153 feet long, 48 broad, and 55 high, used for city feasts, etc. It contains the curious wooden statues of Gog and Magog. In the common-council room is a collection of pictures, some of them valuable. There is also a library in the Guildhall.

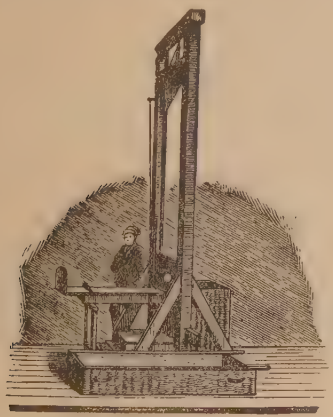
Guillemot (gil'e-mot), a name of several web-footed birds belonging to the family Alcidæ or auks. The guillemots have a straight, com-

pressed, and pointed bill, covered with feathers as far as the nostrils, and have no hallux or hind-toe. The wings are pointed and very short, the legs also short, and placed far back. They live on fish, and build on precipitous rocks adjoining the sea. The common guillemot (*Uria troile*), about 18 inches in length, lays one egg; the black guillemot (*U. grylle*), of the North Atlantic, is smaller and lays two or three eggs; the *U. lacteolus* is entirely white.

Common Guillemot (*Uria troile*).

Guilloche (gil-losh'), in Grecian architecture, an ornament consisting of straight or curved bands symmetrically interplaited.

Guillotine (gil-lo-tēn'), an engine for beheading persons at one stroke—an invention of the middle ages—adopted with improvements by the National Assembly of France during the first revolution on the proposal of a Dr. *Guillotin*, after whom it is named and still used in France. The original invention of machines of this kind is ascribed to the Persians, and similar instruments were in use in Italy and Germany in the middle ages. In the guillotine decapitation is effected by means of a steel blade loaded with a mass of lead, and sliding between two upright posts, grooved on their inner sides, the person's neck being confined in a circular opening between two planks, the upper one of which also slides up or down. The condemned is strapped to a board, which in the cut is shown resting horizontally on the table in front of the upright posts, but which is easily drawn forward and set upright when necessary, and again canted over upon the table and rapidly moved up so as to place the neck of the condemned within the semicircle of the lower plank, the other being raised for the purpose. On the right of the table is a large basket or trough of wicker-work for the reception of the body. Under the place where the head rests is an oblong trough for its reception. The knife is fixed to the cap or lintel on the top of the posts by a claw in the form of an 8, the lower part of which opens as the upper part closes. This claw is acted upon by a lever, to which a cord is attached.



Guillotine as used in Paris.

Guimaraens, or GUIMARÆS (gē-mâ-rāns'), a town in Portugal, province of Minho, strongly fortified and well built. Pop 9104.

Guimaras, an island of the Philippines between Panay and Negros. It is about 24 m. long, and is mountainous in the w. (highest peak, Mt. Jaljat), and flat in the s. Pop. 20,000.

Guimbal, pueblo, Iloilo, province, s. coast of Panay I., Philippines, 65 m. s. s. w. of Conception. Dyewoods and woven fabrics are exported. Pop. 11,000.

Guindulman, a town at the southeast extremity of Bohol Island, Philippines. Pop. 12,000.

Guinea (gin'ē), a geographical division of Western Africa, including the Atlantic coast-line and an indefinite area of the interior between the frontiers of Senegambia and Cape Negro, or Cape Frio (where German territory now begins). It is divided into two districts, lying north and south of Cape Lopez; the former, called North or Upper Guinea, includes Sierra Leone, Liberia, the Grain, Ivory, Gold, and Slave coasts, the states Ashantee, Dahomey, Benin, etc.; the latter, called South or Lower Guinea, includes Congo, Angola, and Benguela. See the separate articles.

Guinea, an English gold coin worth 21*s.* sterling. Guineas were first coined in the reign of Charles II (1663), of gold from Guinea, and bore the figure of an elephant. Its value ranged at different times from 20*s.* up to 30*s.*, until, in 1717, it was fixed at 21*s.* In 1817 the coin was withdrawn from circulation. It is, however, still customary to estimate professional honoraria, etc., in guineas.

Guinea, GULF OF, that portion of the Atlantic which washes the shores of Upper Guinea, between Cape Palmas and Cape Lopez, and including the bights of Benin and Biafra. The islands of Fernando Po, Prince's, and St. Thomas, are within this gulf.

Guinea, NEW. See *New Guinea.*

Guinea-corn, a name given to durra, one of the grains also called millet. In the United States it is cultivated under the name of broom-corn.

Guinea-fowl, or PINTADO, a genus of gallinaceous birds, family Phasianidæ or pheasants, originally all natives of Africa. The common guinea-fowl (*Numĭda meleagris*), now well known as a domestic fowl, has a slate-colored plumage varied with round white spots. It is about the size of a common fowl, and is of a noisy and quarrelsome disposition. Its eggs are

Guinea-fowl (*Numĭda meleagris*).

esteemed. Among the other species of guinea-fowl may be mentioned the *Numĭda vulturina* (or *Acryllium vulturĭnum*), by far the most beautiful of them all, with somewhat vulturine head and neck; the *Numĭda mitrăta*, found in Kaffraria and in Madagascar; and the *Numĭda cristăta*, a native of the Cape of Good Hope.

Guinea-grass (*Panĭcum maximum*), a very tall species of grass, a native of Africa, of the same genus with the millet, often 6, and sometimes even 10 feet in height. It has been naturalized in South America and the West Indies, and largely cultivated for fodder. It does not perish even in the temperate zone, but there it is not so productive as in warmer climates.

Guinea Pepper (*Xylopia aromatica*), a lofty tree of the same family with the custard apple. Its fruit, consisting of dry carpels, is used as pepper, 'Negro Pepper.' The term Guinea Pepper is often used as an equivalent for *Grains of Paradise*, or Malaguetta. It is also a common designation of *Capsicum frutescens*. See *Capsicum.*

Guinea-pig, a well-known rodent mammal, family Caviidæ or Cavies. The domestic specimen is sometimes regarded as descended from *Cavia aperea*, and sometimes termed *Cavia cobaya*. It is a native of South America (like the other cavies), and resembles the pig only in its grunting voice. It is a timid little animal, extremely prolific, and it feeds on vegetables, especially parsley, bread, grain, etc. It is very destitute of intelligence.

Guinea-plum, the fruit of a West African tree, *Parinarium excelsum*, order Chrysobalanaceæ, growing to the height of 60 feet.

Guinea-worm (*Filaria Medinensis*), a parasitic worm of the order Nematoda, white, of the thickness of pack-thread, somewhat attenuated at the hook-shaped posterior extremity. It varies in length from 6 inches to several feet, and it is found in the intertropical regions of the Old World. It is frequently found in the tissue of the human body below the skin, and produces a painful ulcer, out of which a small portion of the worm issues to eject its eggs. It is then carefully extracted by winding it round a stick once or twice every day, care being exercised not to break the worm. The manner in which it effects an entrance into the body is unknown.

Guingamp (gaṇ-gäṇ), a town in France, dep. Côtes-du-Nord, on the Trieux; has manufactures of linen, thread, etc., and several tanneries. Pop. 9233.

Guipuzcoa (gē-pŭth'ko-â), one of the three Basque provinces, in the N. E. of Spain, bounded N. by the Bay of Biscay; N. E. by France; area, 728 square miles. The coast is bold and 728 sq. miles. The coast is bold and rocky, and much indented; the interior is generally mountainous. The chief riches of the province are in its minerals, particularly iron, and its woods, which are used in smelting it. San Sebastian is the capital. Pop. 195,850.

Guisborough (giz'bu-rō), a town in England, in the county of York (North Riding), situated in a narrow but fertile valley, extending along the Tees. It has ropeworks and tanning. Pop. 7,062.

Guiscard (gis-kär), ROBERT (that is, *Robert the Cunning*), Duke of Apulia and Calabria, a son of Tancred de Hauteville, born in 1015. His brothers, having acquired large possessions in Italy, Robert followed them about

1053, and in the same year captured Pope Leo IX at Civitella. On the death of his brother Humphrey he was proclaimed count of Apulia in 1057. He then conquered Calabria, and Pope Nicholas II made him gonfalonier of the church. Having become a tributary of the holy see, and suppressed the privileges of the Apulian nobility, he sent his youngest brother, Roger, to seize Sicily. Robert himself arrived in Sicily in 1061, and, in conjunction with his brother, defeated the Saracens at Enna. Returning to Italy, Robert conquered the towns still remaining in the hands of the Saracens, being detained from 1068 to 1071 at the siege of Bari. In 1074 he was excommunicated by Gregory VII for refusing to become his vassal, but the ban was removed in 1080. As his daughter Helen was betrothed to the son of the Byzantine emperor, Michael VII, Guiscard, on the latter's deposition, took up arms in his favor, and defeated Alexis Comnenus at Durazzo (1082). As Gregory VII had been meanwhile imprisoned by the invading forces of Henry IV of Germany, Guiscard delivered the pontiff in 1084. He then went again to Epirus, where he repeatedly defeated the Greeks, and, by means of his fleet, made himself master of many of the islands of the Archipelago. He was upon the point of advancing against Constantinople, when he died in the island of Cephalonia in 1085.

Guise (gwēz), a town of France, dep. of Aisne, beautifully situated on the left bank of the Oise. It has manufactures of textiles, iron and copper foundries, etc., and a large work for making stoves, connected with which is an edifice in which live some 400 families of the working people. It is an ancient city, and its castle gave its title to the distinguished family of that name (see the following article). Pop. (1906) 7562.

Guise (gwēz), a distinguished ducal family of France, a branch of the house of Lorraine. The founder was Claude, a son of René II, duke of Lorraine, who in 1506 became naturalized in France. In his favor the county of Guise was erected in 1528 by Francis I into a duchy. He died in 1550, leaving behind him five daughters (the eldest of whom, Marie, married James V of Scotland, and was the mother of Mary Queen of Scots), and six sons—François, who succeeded him, Charles (Cardinal of Lorraine), Louis (Cardinal of Guise), Claude, François, and René. The family acquired great political importance on the accession of Francis II, who was married to Mary Queen of Scots. The direct line became extinct in 1675. In 1704 the title was revived for the house of Condé. —Two of the dukes require particular mention.—François de Lorraine, the second duke, born in 1519, early distinguished himself in war, especially at Metz, which he defended with success against Charles V, and at the battle of Renti, 1544. In his Italian expedition (1556-57) he failed to conquer the kingdom of Naples. But he was successful in that which resulted in the final annexation of Calais to France. Under Henry II and Francis II he was the virtual ruler of France. On the death of Francis II the factions of Condé and Guise arose, the Protestants (Huguenots) being on the side of the former, the Catholics on that of the latter. When civil war broke out the Duke of Guise took Rouen and Bourges, and won the battle of Dreux in 1562. He was preparing for the siege of Orleans, the central point of the Protestant party, when he was assassinated by a Huguenot nobleman, Feb., 1563. He left memoirs written by himself.—Henry, third duke, eldest son of the preceding, was born in 1550. He was a bitter opponent of the Huguenots, and fought against them at Jarnac and Moncontour, and advised the massacre of St. Bartholomew (1572). From revenge he personally conducted the assassins to the house of Coligny. In 1576 was formed the Catholic League, first projected by his uncle, the Cardinal of Lorraine. A period of civil war followed, the party of Guise proved too strong for his opponents, and having brought about a rising of the Catholics in Paris (May 1588), he entered the city in triumph. He might now have made himself master of the throne, but negotiations were set on foot, and the duke's displays of imprudent ambition led to his assassination in the king's cabinet. December 23, 1588, at Blois, whither the states had been summoned in order finally to ratify the treaty that had been arranged.

1, French Guitar of Seventeenth Century. 2, Modern Guitar.

Guitar (gi-tär'), a stringed instrument with a hollow body, and a neck somewhat similar to that of a violin, used especially to accompany the voice.

The modern or Spanish guitar has six strings, the three highest of gut, the three lowest of silk covered with fine wire, tuned respectively to the E in the second space of the bass staff, A its fourth, and the treble D, G, B, and E. The intermediate intervals are produced by bringing the strings, by the pressure of the fingers of the left hand, into contact with the frets fixed on the key-board, while those of the right pluck or twitch the strings. It is extremely popular in Spain. The Spaniards derived it from the Moors, who brought it from the East.

Guizot (gē-zō), FRANÇOIS-PIERRE-GUILLAUME, a French historian and statesman, born at Nîmes in 1787; died in 1874. His father, a lawyer, having in 1794 perished by the guillotine, his mother and her three sons retired to Geneva, where François was gratuitously educated at the gymnasium. In 1805 he commenced legal studies at Paris, but gradually drifted into the literary profession. In 1812 he married Mlle. de Meulan, editor of the *Publiciste*, and became professor of history at the Sorbonne. On the fall of the empire he obtained several public offices, such as councilor of state, and director-general of the departmental and communal administration. In 1816 he published *Du Gouvernement Représentatif et de l'Etat actuel de la France*, and *Essai sur l'Instruction Publique*. In 1820 the Duc de Berry was assassinated, and Guizot's party fell before in ultra-royalist reaction. In 1825 he was deprived of his chair on account of the political character of his lectures, but it was restored to him in 1828. In 1829 he again became councillor of state, and in 1830 was elected deputy for the arrondissement of Lisieux. After the July revolution he was appointed minister of the interior, but resigned in 1831. After the death of Périer, Guizot, along with Thiers and De Broglie, formed a coalition ministry, and he rendered great service as minister of public instruction. He became ambassador at the British court in 1840, and next year he became the real head of the government of which Soult was the nominal chief. He retained the office of minister of foreign affairs until 1848, and during that period opposed all measures of reform. After the fall of Louis Philippe, Guizot escaped and fled to England. Henceforth he practically retired from public life. Born of a Calvinist family, Guizot always remained a stern Protestant of the orthodox type, although he zealously supported the temporal authority of the pope. Among his numerous works may be mentioned, *Histoire de la Civilisation en France*, *Histoire générale de la Civilisation en Europe*; *Histoire de la Révolution d'Angleterre*; *Washington*; *Discours sur la Révolution d'Angleterre*; *Méditations et Etudes Morales*; *Guillaume le Conquérant*; *Mémoires pour servir à l'Histoire de mon Temps* (1858-68); *Méditations sur l'Etat Actuel de la Religion Chrétienne*; *Mélanges Biographiques et Littéraire*; *Histoire de France Racontée à mes Petits Enfants*; etc.

Gujerat, GUJARAT (gö-ja-rät'), or GUZERAT, a maritime province in Western Hindustan, Presidency of Bombay; total area, 70,038 sq. miles; pop. over 9,000,000. The southwest portion is an extensive peninsula, with the Gulf of Kach (Cutch) on the northwest side, and the Gulf of Cambay on the southeast. The central districts form an extensive plain, but the northern and eastern districts are mountainous, rugged, and jungly. The rivers include the Narbada, Myhe, and Sabarnati. The climate is very hot in summer, and during the hot months the surface mostly appears sand or dust, and in the rainy season a thick mire; but it is extremely fertile. Gujerat comprises a number of native states within its area, the chief being the scattered territories of the Gaekwar or Guicowar of Baroda. The population presents an extraordinary assemblage of sects and castes. It gives name to the vernacular language of Northern Bombay—Gujarâti. The area of the British portion, comprising the districts of Surat, Broach, Kaira, Panch Mahals, and Ahmedabad, is 10,158 square miles, and the population estimated at about 4,798,504.

Gujranwála (güj-rän-wä'la), a town of India, in the Punjab, administrative headquarters of a district of the same name. It has inconsiderable manufactures of country wares, such as brass vessels, etc. Pop. about 30,000.—Area of district, 2578 square miles.

Gujrát (göj-rät'), a district of India in the lieutenant-governorship of the Punjab, in the Rawâl Pindi division between the Jehlam and the Chenab. Pop. about 700,000.—GUJRAT, the capital, 5 miles from the Chenab, is a commercial center. Its manufactures are principally of cotton and of Gujrât ware, that is, inlaid work in gold and iron. Pop. 19,410.

Gulbar'ga (göl-bär'ga), a town of India, in the state of Hyderabad. Pop. 29,228.

Gulden (göl'den), a silver coin of Austria-Hungary and also of Holland, worth about 40 cents. Also called a *florin*.

Gules (gūlz), the heraldic name of the color red. See *Heraldry*.

Gulfport, a city, port of entry, and county seat of Harrison Co., Mississippi, on Mississippi Sound, an arm of the Gulf of Mexico, 67 miles E. of New Orleans. Noted for its great exports of pitch-pine lumber. It manufactures automobiles, rubber tires, etc., and has creosoting and wood-reduction plants, saw mills, car shops, etc. The Gulf Park College for girls and a U. S. naval station are here. Pop. (1920) 8157.

Gulf Stream, one of the most celebrated of the oceanic currents, so called because it issues from the Gulf of Mexico. It owes its origin to the fact that the westward-moving waters of the tropical portion of the Atlantic, encountering the eastward projection of South America, become divided into two currents, one setting southwards along the Brazilian coast, and the other northward past the mouths of the Amazon and Orinoco, into the Caribbean Sea. It then enters the Gulf of Mexico, and thence emerges through the Channel of Florida as the Gulf Stream. Its course is next to the north and eastward, in a direction parallel to the coast of the United States, past Cape Hatteras (lat. 35° 13′), along the southern edge of the 'great banks' of Nantucket and Newfoundland (between the meridians of 48° and 60° west), after which its course as a distinct current cannot be traced. In the earlier part of its course, especially when rounding the extremity of Florida, the Gulf Stream forms a well-defined current, distinguished by its high temperature and its deep blue or indigo color. On account of the descent of the Polar or Baffin Bay current along the coast in a direction opposite to that of the Gulf Stream, the water on its inland side is colder than that to the eastward of it. The difference of temperature between the Gulf Stream and this cold current sometimes amounts to 20° (or even 30°) Fahr. The velocity of the Gulf Stream varies with its course. Within the Florida Channel it attains a mean of 65 miles per day, this sinks to 56 miles off Charleston, becomes 36 miles to 46 off Nantucket, and 28 miles to the south of the Newfoundland Banks; 300 miles to the eastward of Newfoundland its movement is hardly perceptible. At the bottom of the Florida Channel the observed temperature is 34°, that of the surface from 80° to 84°. Geographers have greatly exaggerated the influence of the Gulf Stream on the temperature of Europe. If it possesses any *direct* influence such must be extremely small, as the current is both too narrow and too shallow, and its slight amount of superior heat probably vanishes after it has passed Cape Hatteras. The relatively high temperature of western and northwestern Europe must rather be referred to the general set of the tropical waters to the northeast, and to the warm winds blowing in the same direction, and not to the Gulf Stream exclusively.

Gulf-weed (*Sargassum*), a genus of seaweeds (Algæ) suborder Fucaceæ, of which one species, *S. Bacciferum*, exists to an enormous extent in the tropical seas. It floats on the surface, and is propagated by buds. It derives its ordinary appellation from the exploded idea that it is borne on the Gulf Stream from the Gulf of Mexico. Several areas of the ocean exhibit great quantities of this and other weeds floating on the surface. One such, the Sargasso Sea, is in the North Atlantic, lying southwest of the Azores, and north of the tropic of Cancer.

Gull (gul), the general name of a family of birds distinguished by their straight bill, bending downwards towards the point, and marked below the under mandible by a triangular prominence, by their large wings, slender legs, palmated feet, and small hind toe. Generally seen in large flocks, the larger species frequent the sea, the smaller, lakes or rivers. They swim well, but are incapable of diving. Their flight is rapid and long sustained. They are extremely voracious, and feed on every kind of

Lesser Black-Backed Gull (*Larus fuscus*).

animal food, putrid or fresh. Their principal food is fish, which they catch with great agility, darting down like an arrow. They breed only once a year, laying two to four eggs. The species are exceedingly numerous, and resemble each other greatly. Among the principal are the common gull (*Larus canus*), which breeds on the coast, or inland in moory districts; the lesser black-backed gull, *L. fuscus;* the black-headed gull, *L. ridibundus*, of which the masked gull, *L. capistrātus*, is only a variety; the ivory

gull, *L. eburneus;* the Iceland gull, *L. islandicus*, distinguished by its white quill feathers from the herring gull, *L. argentātus;* the great black-backed gull; the burgomaster; the little gull, sabine's gull; the kittiwake, etc.

Gullet. See *Œsophagus.*

Gulper (gul'pẽr), a deep sea eel, remarkable for the extraordinary width of its mouth.

Gulper (*Saccopharynx ampullaceus*).

Gum, a substance of various properties which exudes spontaneously from the bark of certain trees, such as the plum, the peach, etc., or from incisions made in the bark to facilitate the flow. Gums form non-crystalline rounded drops or tears, the purest varieties being transparent or translucent, of a pale yellow but sometimes of a dark color. When dissolved in water gum forms a thick, smooth fluid, with considerable viscosity. Some gums, such as gum-arabic, dissolve in water; others, like tragacanth, are only partially soluble; they are insoluble in alcohol, this property distinguishing them from resins. They have no odor, and only a very faint taste. The different kinds of gum receive their names from the countries from which they are imported—such as gum-arabic, gum-senegal, Barbary gum, East India gum, etc., and from individual features, as cherry-tree gum, tragacanth, etc. *Gum-resins* require water and alcohol to dissolve them. See *Gum-resins.*

Gumal. See *Gomul.*

Gum-arabic, is the purest form of gum, and may be regarded as typical. It comes from various species of Acacia, such as the *Acacia vera, A. seyal,* and *A. arabica* or *nilotica* (see *Acacia*). The gum exudes spontaneously, and its appearance is an indication of the tree being in an unhealthy condition; but in order to get it in sufficient quantity incisions are made in the bark. Gum-arabic is very largely employed in the finishing and dressing of fabrics; for thickening the colors in calico-printing; in pharmacy; as a cement; in ink-making; for making crayons and water-color cakes, and for many other purposes. The purest gum-arabic is in round tears, transparent, and almost colorless, faintly odorous, completely soluble in water, the solution being feebly acid.

Gumbinnen (gŏm-bin'en), a Prussian town, prov. East Prussia, on the Pissa. It has brewing and distilling, and manufactures of woolen and linen cloth. Pop. 14,194.

Gum-boil, an abscess in the gum, generally the result of bacterial infection through the presence of decayed teeth or stumps. The carious tooth or stump, if the inflammation proceeds from this cause, should be removed. The purulent matter should be evacuated by a free incision, and the mouth often washed with tincture of myrrh and water.

Gum-cistus (*Cistus ladaniferus*), a plant largely cultivated in Portugal, and yielding a gum of a pleasant balsamic odor.

Gum-dragon. See *Tragacanth.*

Gum-elastic. See *caoutchouc, India Rubber.*

Gum-elemi. See *Elemi.*

Gum-juniper, the resin of *Callitris quadrivalvis*, a coniferous tree of Barbary, used in varnish, etc.

Gumming (gum'ing), a disease of certain fruit-trees, as cherries, plums, apricots, peaches, etc., consisting in a morbid exudation of gum, and generally resulting in the death of the tree.

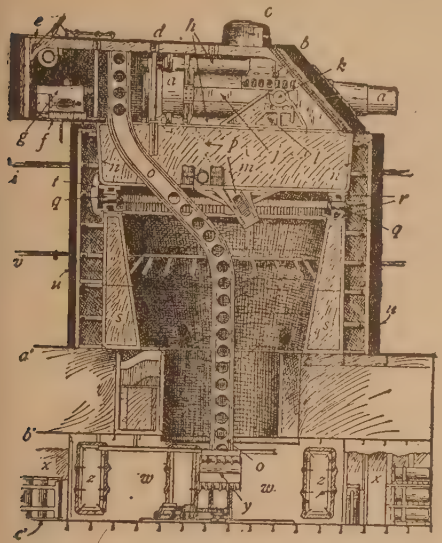
Gum-resins, solidified juices exuded by various plants. They contain a gum, which is soluble in water, and a resin, which dissolves in spirit, so that the body usually is nearly quite soluble in dilute alcohol; but there are usually present in addition essential oil, and a variety of impurities. The gum-resins have frequently a strong and characteristic taste and smell. They are solid, opaque, and brittle. The common gum-resins are aloes, ammoniacum, asafœtida, bdellium, galbanum, gamboge, myrrh, olibanum, opoponax, sagapenum, and scammony.

Gumti, or Goomti (gŏm'tē), a river of Hindustan, rises in the northwest provinces, and flowing southeast falls into the Ganges between Ghazipur and Benares. In its course it passes the cities of Lucknow and Jaunpur. Length about 500 miles.

Gum-trees, a general name for trees of the genus *Eucalyptus* (which see)

Gun, a missile weapon, causing destruction by the discharge of a ball, bullet, or other substance, through

a cylindrical tube, along which it is propelled by the action of gunpowder or other explosive substance. The term includes small arms, such as portable, sporting and military weapons; machine-guns, which discharge a rapid succession of bullets through one or more barrels on a rest; and the heavier pieces termed cannon or ordnance. See *Cannon*, *Rifle*, *Machine-gun*, etc.

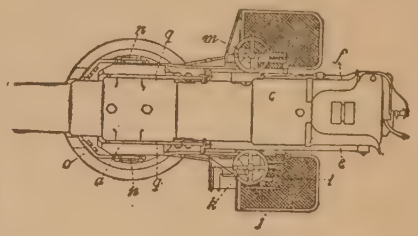


Vertical Section through a Turret and Barbette for 12-inch Guns.

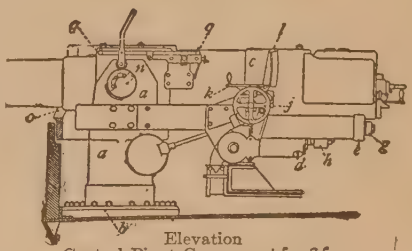
a, turret-gun; *b*, turret-port armor plate; *c*, sighting-hood; *d*, turret-roof; *e*, escape-scuttle; *f*, scuttle for access from deck; *g*, electric rammer; *h*, *h*, combined hydraulic recoil and spring return-cylinders; *i*, main deck; *j*, gun-sleeve; *k*, trunnions on gun-sleeve; *l*, deck-lug; *m*, turret-gun girder; *n*, turret-pan; *o*, ammunition-hoist guide-rails; *p*, gun elevating gear; *q*, turret-rollers; *r*, *r*, upper and lower turret-roller paths; *s*, *s*, turret supports or foundations; *t*, holding-down clip; *u*, barbette-armor; *v*, gun-deck; *w*, handling-room; *x*, *x*, magazines; *y*, ammunition-hoist carriage; *z*, water-tight doors from magazines and shell-rooms to handling-room; *a'*, protective deck; *b'*, upper platform; *c'*, lower platform. (From *Scientific American*.)

Gunboat, a war-vessel belonging to the class next in size below a cruiser, and mounting one or more heavy guns. They are useful because of their light draft, which enables them to run close in shore or up rivers whose depth would prevent the passage of larger vessels. The term was originally applied to small vessels mounting one gun, but in the United States navy the term is applied to men of war of less than 2000 tons, equipped with large and small ordnance and capable of considerable speed though the light draft feature is retained. Special gunboats have been built for shallow rivers, but the class is not a large one and is not apt to be greatly added to because of its limited range of effectiveness except for special purposes.

Gun-carriage, the structure on which a cannon is mounted, and on which it is fired. Gun-carriages are of very various constructions. In the case of a field or siege piece the carriage is united, for traveling, with a two-wheeled forepart, termed a *limber*, to which the horses are attached, so as to form a single four-wheeled carriage. In action the gun is unlimbered, and then rests on its pair of wheels, and on a strong support termed the *trail*. A gun in a fortress has its carriage commonly mounted on



Plan



Elevation

Central Pivot Gun-mount for 6-in. Rapid-Fire Gun.

a, top-carriage saddle; *b*, pedestal or pivot (the only part of the pedestal showing in the cut is the deck-flange, the remainder being in the interior of the top-carriage); *c*, cylindrical sleeve; *d*, hydraulic recoil-cylinder; *e*, *f*, spring return-cylinders; *g*, projecting arm by which gun is attached to spring return-rods; *h*, projecting arm by which gun is attached to recoil-cylinder piston-rod; *j*, hand-wheel for elevating gear; *k*, hand-wheel for training gear; *l*, shoulder-piece; *m*, auxiliary training-wheel; *n*, *n*, trunnion bearings; *o*, gun-shield; *q*, *q*, gun-sights.

what is termed a *traversing platform*, that is, a strong framework supported on metal trucks or small wheels. These trucks are constructed to run on metal rails, which are laid in concentric arcs of circles, whose centers are a real or imaginary pivot close to the mouth of the embrasure through which the gun fires. By this means the muzzle of the gun, when run up, is brought nearly over the pivot, so that the direction of its fire may be altered laterally considerably, and yet allow of a very narrow embrasure. Carriages on the 'disappearing principle,' which are visible to the enemy only during the acts of aiming and firing (while the loading is effected under shelter), are best exemplified in those of Col. Moncrieff. In one of these the carriage is so contrived that a heavy counterweight attached to it is sufficient to raise the gun into the position for firing, the sides of the carriage having some resemblance to the 'rockers' of a rocking-horse. The recoil brings the gun down into the loading position, after which it is again brought into firing position as before. The iron carriages now made are thus elaborate mechanical structures. In mortars a cast-iron bed takes the place of a carriage.

Guncotton, or PYROXYLINE, is an explosive substance formed by the action of nitric acid on cotton. In the process of manufacture sulphuric acid is mixed with the nitric, its function being to absorb the water formed by the weakening of the nitric acid as it gradually combines with the cotton. The product of this process is a chemical compound of four or five times the explosive power of gunpowder. The cotton is generally reduced to a finely divided condition, and the guncotton molded into discs of suitable sizes. When ignited in a free state it burns with a strong flame; it is only when fired by a detonating fuse or when heated in confinement that it explodes. The presence of water and other substances does not interfere with this kind of explosion. From this follows the important fact that it can be kept wet with safety while in a condition in which it may be exploded by means of a detonator. *In short, when wet it is quite safe, and yet quite ready for work at a moment's notice;* for, while it refuses to burn even in the heat of a powerful flame, the application of a large or of a small detonator inserted in one dry disk of guncotton causes the wet mass to explode with its full violence. Bursters of guncotton and water have been used in shells for certain purposes. When exploded it produces little smoke and a very small amount of residual matter. There are also preparations allied to guncotton with wood fiber as a basis, such as Schulze's powder, sawdust powder, etc. An imperfect chemical form of guncotton termed collodion, soluble in a mixture of ether and alcohol, is used in photography and surgery.

Gunduck. See *Gandak.*

Gunja. Same as *Hashish.*

Gunnel (gun'el), or BUTTERFISH (*Centronōtus gunellus*), a fish which belongs to the family of the Blennies. The common gunnel resembles an eel, is about 6 inches in length, is brown in color and has black spots on the base of the dorsal fin. It is termed 'butterfish' on account of the mucous secretion of its skin.

Gunner, in the United States navy is a warrant officer of the line who ranks as assistant to the ordnance officer and under him is responsible for the ordnance of the ship. Gunners are promoted from the leading petty officers after examination and after six years' service are eligible to take the examination for chief-gunner and if they pass rank with (but after) ensigns, also to take examinations for appointment as ensigns.

Gunnera (gun'er-a), a genus of plants of the breadfruit order, one species of which (*G. scabra*), a native of S. America, somewhat resembles the rhubarb, and is used as an ornamental plant. It has large rough leaves, astringent roots, while its leaf-stalks are a substitute for rhubarb.

Gunnery (gun'er-i), the science of conducting the fire of artillery. Gunnery may be divided into the theoretical and practical branches. The former consists chiefly in the application of mathematics to the solution of the problems in dynamics involved in the consideration of the motion of shot through the air, and is essential to the design of good systems of rifling and well-proportioned projectiles. Practical gunnery, which deals with the actual firing, has reference rather to the use of individual guns than to the handling of artillery on a large scale. Theoretical gunnery would be simple were the projectiles fired in vacuo, as gravity alone would, in such a case, require to be taken into account, and the path of projectiles would simply describe a parabola. The line taken by a projectile (or its *trajectory* as it is called) is, however, subject to modifications caused by the resistance of the air, the form of the shot, etc. Among the things to be considered in

gunnery are the *velocity* of the projectile, initial and subsequent, the *angle of elevation* of the piece, the *range* or distance to which the projectile is carried, etc. With cast-iron spherical shot the chief complication arises from the center of gravity never falling exactly in the center of the figure. Rifled guns, however, fire projectiles with a *certain known rotation*, and in the case of elongated shot, these are more accurately centered in the bore by the action of the grooves, and possess the faculty of traveling point first, and of thus overcoming the resistance of the air. One mechanical disadvantage belongs to rifled shot, namely, the wild irregularity of their ricochet, a disadvantage which, however, does not apply to shells burst on the instant of graze by percussion fuses, or before contact by time fuses. The most approved projectiles have their centers of gravity nearly half way along their axes, and in flight they carry towards the right hand of the person laying the gun, a species of deviation to which the name of *drift* or *deflection* is given. The recoil of a gun must necessarily diminish the velocity of its projectile; and this has been carefully borne in mind by men who have made gunnery their especial study.

Gunnison River, a stream of Colorado, about 200 miles in length, which flows into Grand River at Grand Junction. In its course are several magnificent cañons, the Grand Cañon being about 40 miles long, and 2500 feet in depth. There is a tunnel through the bordering mountain.

Gunny-bags are bags made of a coarse cloth or sacking manufactured in India of some native fiber, chiefly jute. They are extensively used in India in packing rice, sago, spices, etc., for export, and in America for bales of cotton.

Gunpowder (gun'pow-dêr), a mixture of saltpeter, sulphur, and charcoal. We hear of gunpowder from a very early period. It appears to have been used in China before the Christian era, though it is doubtful if they understood the making of this explosive in its modern sense. Marcus Græcus, who lived about the ninth century, describes its composition, which was also known to Roger Bacon, who refers to it in 1267. It was also apparently known to the Arabs at an early period. In 1342 the Moors employed it in the siege of Algeciras. According to the common story, the discovery of its propulsive power was due to the German monk Berthold Schwarz between 1290 and 1320. Guns are said to have been employed by Edward III in 1327, on his invasion of Scotland. It is also asserted that gunpowder was employed in 1346 by the English at Crécy. It was not, however, until the sixteenth century that its use in warfare became general. The proportion of the ingredients in the composition of gunpowder is different in different countries, and in powder for different purposes. The crude saltpeter is dissolved in an equal weight of boiling water in a copper boiler, filtered, and allowed to cool and crystallize in a trough in order to purify it from nitrates of soda and lime, chlorides of potassium and sodium, etc., the liquid being continually agitated, so that the crystals may be formed small and pure. They are then washed and allowed to drain. The sulphur is purified and ground. The charcoal is obtained from alder and willow wood, or from dogwood for the finest powder. These ingredients are first roughly mixed, then sprinkled with water and incorporated under rollers in a mill, and formed into a cake termed 'mill cake.' This is broken up under grooved rollers, and brought by pressure into 'press cake.' After this it is granulated, by being passed between toothed rollers, and separated into classes by sieves of different sizes of mesh. Within recent years a very large grain has been adopted for the heaviest charges; this is termed pellet or pebble powder. 'Pellet' powder is made by filling the cylindrical holes in a thick gun-metal plate with mealed powder, and by means of pistons under an hydraulic press, forming them into short cylinders or 'pellets,' with a small cavity at one end to catch a flame the more readily. 'Pebble' powder is made by cutting or pressing edges which divide the press cake into small cubes; these, like pebbles, have their corners rubbed off and rounded by friction. There is also 'Brown' powder, the composition of which is not well known. This powder is remarkable for equable action, greater coherency, and diminished danger in using, and for decidedly greater power under diminished pressure of gas in the barrel. Schultze's powder is also a powerful explosive, remarkable for the uniformity of its shooting. As it is necessary that the flame must traverse the interstices between the grains, the grain must be suited to the size of the charge of the gun. A smokeless powder has also been introduced. The greatest precautions must be taken to prevent fire or water from coming into contact with gunpowder. Hence it is usually kept in magazines which are of great strength in defensive works, although lighter and

well-ventilated buildings suffice under other conditions. In the transportation of gunpowder, the casks should be dust-proof, and the carriages and vessels containing it should be water-tight. As iron vessels are dangerous, gunpowder is usually packed in copper-hooped barrels made with copper nails. The explosive power of gunpowder is very great. It is, however, necessary to place it within a confined space, as, when it is heaped up in the open air, it explodes without report or much effect. As the result of experiments it appears that the weight of the gases produced by inflaming gunpowder is about six-tenths of that of the powder, and their volume 288 times its bulk, when they have attained an elasticity equal to that of the air. If the effect of heat evolved during the combustion be added, the elastic force is increased to 1000 atmospheres in round numbers.

Gunpowder, SMOKELESS. See *Smokeless Powder.*

Gunpowder Plot, a conspiracy formed in England in 1604, the second year of the reign of James I, by misguided Roman Catholics, to blow up the king and parliament in order to be revenged on the government for its severities against their religion. The time ultimately fixed for the execution of the plot was the 5th of November, 1605, when parliament was to be opened by the king in person. The plot originated with Robert Catesby, Thomas Winter, and John Wright, and was at once made known to Guido Fawkes, a zealous Catholic, who had served in the Spanish army in Flanders, and to Thomas Percy, a relation of the Earl of Northumberland. These five were the original conspirators, but the plot was subsequently communicated to Sir Everard Digby, Ambrose Rookwood, Francis Tresham, Thomas Keyes, Christopher Wright (a brother of John), and to some Jesuit fathers and others. The conspirators took a house next the Parliament House, and their original plan was by digging under this house to undermine the House of Parliament. They latterly discovered, however, that there was a cellar right under the chamber of parliament, which was occupied by a coal-dealer. They at once hired this cellar, and filled it with powder, faggots, and billets. The plot was discovered by means of a letter sent to Lord Mounteagle, a Catholic peer in favor with the court, who laid it before the secretary of state, Cecil. It was a warning couched in mysterious terms, not to be present at the approaching meeting of parliament. Cecil showed it to some of the council, and did nothing till the return of the king from a hunting party. On hearing the letter James at once divined its meaning, and declared that it referred to gunpowder. This led to investigation and to the arrest of Fawkes in the cellar, where a hogshead and thirty-six barrels of powder were discovered. It is now very generally thought that Tresham, the reputed author of the letter to Lord Mounteagle, had previously informed his lordship of the plot, and that the sending and publication of the letter were merely intended as blinds. It seems also that Cecil, knowing the king's vanity, was desirous of making him the discoverer of the plot. Catesby, Percy, and the two Wrights were killed in defending Holbeach House, in which they had taken refuge, against the sheriff. Sir Everard Digby was tried and executed at Northampton; Tresham died in prison. Fawkes, Rookwood, Winter, and others were tried at Westminster on January 27th, 1606, and executed on the 30th and 31st.

Gunroom, a compartment in a ship of war, partly occupied by the junior officers.

Güns (günz), a town of Hungary, 57 miles S. E. of Vienna. It consists of a walled town of limited extent, and a large suburb; staple manufacture woolen cloth. Pop. 7930.

Gunter (gun'ter), EDMUND, an English mathematician, who flourished in the reign of James I, and invented the instruments mentioned in following articles, as also the sector, etc. He was born in 1581 and died in 1626. He was educated at Oxford, and became professor of astronomy in Gresham College, London, in 1619. He was the first to employ the terms *cosine, cotangent,* etc.

Gunter's Chain, the chain in common use for measuring land; so called from its inventor, Edmund Gunter. Its length is 66 feet, or 22 yards, or 4 poles of 5½ yards each; and it is divided into 100 links of 7.92 inches each. 100,000 square links make 1 acre.

Gunter's Scale, a scale having various lines upon it, of great use in working problems in navigation. This scale is usually 2 feet long and about 1½ inches broad. On the one side are the natural lines, and on the other the artificial or logarithmic ones.

Guntur (gun-tör'), a town of Hindustan, presidency of Madras, district of Kistna, 46 miles from Masulipatam, and 30 miles from the Coromandel coast. Pop. about 30,000.

Gunwale, or GUNNEL (gun'l), the upper edge of the side of a ship or boat.

Gurhwal, GURWAL. See *Garhwal.*

Gurjun (gur'jun), a thin balsam or oil, derived from trees of the genus *Dipterocarpus*, in Burmah and the Eastern Archipelago. It is used in varnish-making, for mixing paints, preserving wood from the attacks of white ants, and also medicinally.

Gurkhas. See *Goorkhas.*

Gurmukteswar (gör-muk-tes'wär), a town of British India, in the Meerut district, Northwestern Provinces, on the Ganges, which is here crossed by a much-frequented ferry. A great annual fair attracts 200,000 pilgrims from all parts of the country. Pop. about 8000.

Gurnard (gur'nard), or GURNET, the popular name of acanthopterous fishes of the genus *Trigla*. The head is angular and wholly covered with bony plates. The body is elongated, nearly round and tapering; there are two dorsal fins; the pectoral fins are large; the teeth are small and numerous.

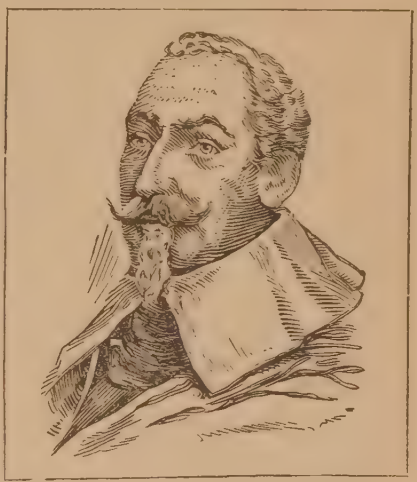
Gray Gurnard (*Trigla gurnardus*).

The gray gurnard is the *Trigla gurnardus*, common on the British coast; the red gurnard is the *T. cucūlus*, also common on the same coasts; the flying gurnard is the *T. volitans*, which inhabits the Mediterranean, Atlantic, and Indian seas.

Gurney (gur'ni), SIR GOLDWORTHY, inventor; born at Treator, England, in 1793; died in 1875. He studied medicine but gave his attention to chemistry. His inventions include the lime-magnesium and oil-gas lights, the high-pressure steam jet, the tubular boiler, a steam carriage, etc., and he claimed the invention of the oxyhydrogen blowpipe and to have been the first to observe the deflection of the magnetic needle by voltaic cross currents. He was knighted in 1863.

Gustavus I (gus-tā'vus), commonly called *Gustavus Vasa*, was born in 1490, or, according to others, in 1496. He was the son of Eric Johansson, a Swedish noble, served under Svante Sture, the administrator of the kingdom, was treacherously carried off with other noble Swedes by Christian II of Denmark, and kept a prisoner in Jutland for more than a year, but at length escaped, reached, after many dangers, Dalecarlia, where he roused the peasants to resist Danish oppression, defeated the Danes, took Upsala, Stockholm, and other towns, and drove the Danes out of Sweden. Solicited to become king, he consented, and was crowned in 1527. In 1529 he procured the abolition of the Roman Catholic religion in Sweden, and established Protestanism in its stead. He died in 1560. During his long reign Sweden made great progress in commerce and civilization.

Gustavus II, GUSTAVUS ADOLPHUS, King of Sweden, a grandson of Gustavus Vasa, was born in 1594, and received a most careful education. He was trained to war under experienced generals, took his place in the state councils at the age of sixteen, and was in command of the army in his seventeenth year during the war with Denmark, which was concluded in 1613, and by which Sweden recovered important possessions on the Baltic. He then turned his arms against the Russians.



Gustavus Adolphus, King of Sweden

Afterwards he was engaged in a war with Poland, which lasted nine years, and was concluded on advantageous terms for Gustavus in 1629, he being allowed to retain important conquests in East Prussia.

His attention was now diverted from northern wars by the affairs of Germany. The oppression of the Protestants by Ferdinand II excited his sympathy, and the progress of Wallenstein alarmed him for the existence of Protestantism in Germany. Probably also he was moved by military ambition. He embarked for Germany in 1630 with about 20,000 men, landed near the mouth of the Oder, and in a short time had seized nearly all Pomerania. After taking many fortified towns, repeatedly defeating the imperial generals, at Leipzig (1631), Würzburg (1631), Passage of the Lech (1632), and conquering a great part of Germany, he was killed in the battle of Lützen, after defeating Wallenstein, 16th November, 1632. (See *Thirty Years' War.*) Though a severe disciplinarian, he was beloved by his soldiers, and the prestige of success derived from his victories lasted long after his death. He ranks among the great soldiers of the world.

Gustavus III, King of Sweden, born in 1746, succeeded his father, Adolphus Frederick, in 1771. Finding the country weary of the misrule of the nobles, he gained the good-will of the army, surrounded the assembly of the states-general, and forced them to accept a new constitution which much restricted their privileges. In 1788 he took command of the army against Russia and Denmark, and stormed the defenses of Frederickshall, destroying a great number of vessels. In 1789 he executed another *coup d'état*, arresting the opposition leaders, and passing a law extending the royal prerogative. On the outbreak of the French revolution he made strenuous exertions to form a coalition between Russia, Denmark, Sweden, and Spain, but while preparations were making, a conspiracy of the nobles was formed against him, and he was shot at a masquerade by Ankarstroem, a disbanded officer, on 16th March, 1792. He died on 29th March.

Gustavus IV (Adolphus), King of Sweden, was born on 1st November, 1778, and succeeded his father, 29th March, 1792. On assuming power Gustavus showed that he had inherited his father's hatred of the principles of the French revolution, which he carried to the extent of fanaticism. After the Peace of Tilsit he exposed himself to a war with Russia while he was at war with France, by refusing to join the continental blockade and opening his ports to England; and in 1808 he quarreled with England, his only ally. Finland was lost to Sweden in consequence, being taken by Russia, and in 1809 a revolution took place. Gustavus was dethroned, and his uncle, the Duke of Sundermania, was proclaimed king under the title of Charles XIII. Gustavus died in poverty at St. Gall, 7th February, 1837.

Gustavus V, King of Sweden, born June 16, 1858; succeeded his father, Oscar II, Dec. 8, 1907. He is a great grandson of Marshal Bernadotte of Napoleon's army, who succeeded Charles XIII in 1818. He married in 1881 the Princess Victoria of Baden, and has three sons, the oldest being the Crown Prince Gustavus Adolphus.

Güstrow (güs'trō), a town of Germany, in Mecklenburg-Schwerin, on the Nebel. It has an active trade and industries of some importance. Pop. (1905) 17,163.

Gut. See *Catgut* and *Silkworm-gut.*

Gutenberg (gō'ten-berg), Johan, the reputed inventor of printing with movable types, was born at Mayence or Mainz, about the end of the fourteenth century. Little or nothing is known of his early life. In 1434 he is said to have been living in Strasburg, and in 1436 to have started or attempted to start a printing office there; but this seems false. In 1448 we find him at Mainz, where he formed, two years after, a co-partnership with Johann Fust, and established, mainly with the money of the latter, a press, in which the *Mazarin Bible*, the *Letters of Indulgence*, and the *Appeal Against the Turks* were printed. After five years this connection was dissolved, and Fust sued Gutenberg for large advances which he could not pay, and by a judgment at law obtained possession of most of the printing materials, with which, in company with his son-in-law Schöffer, he continued to print books. After this, according to some, Gutenberg carried on a separate printing establishment; but there is no printed matter which can be ascribed to Gutenberg after 1454. He died in 1468.

Guthrie (guth'ri), a city, county seat of Logan Co., Oklahoma, on Cottonwood and Cimmeron rivers, 31 miles N. of Oklahoma City. Till 1911 it was the State capital. It has flour and cotton milling interests, printing plants, oil refinery, rug and broom factories, etc. The mineral waters here have curative qualities. Here is St. Joseph's Academy for girls. Pop. (1920) 11,757.

Guthrie, Thomas, a Scottish divine, born at Brechin, Forfarshire, 1803, educated at the University of Edinburgh. The work with which his name is chiefly identified out of

Scotland, was the introduction into Edinburgh of the ragged school system, then recently originated in London and Aberdeen. Into this work he threw himself with characteristic energy, employing in it both his personal labors and his pen. His *Plea for Ragged Schools* (1847) remains one of the most celebrated of his productions. He became editor of the *Sunday Magazine* in 1864, but never assumed full editorial responsibility. He died in 1873. His chief later works are, *The Gospel in Ezekiel* (1855), *A Plea for Drunkards* (1856), *Christ and the Inheritance of the Saints* (1858), etc. An *Autobiography* and *Memoir* has been published by his sons.

Guthrie, THOMAS ANTHONY, author; pseudonym F. Anstey; born at Kensington, England, in 1856. He became a member of the bar in 1880, and subsequently devoted much time to authorship, chiefly of humorous stories. Among his works are: *Vice Versa, The Giant's Robe, The Black Poodle, The Tinted Venus, Love Among the Lions,* etc.

Gutta-percha (gut'a-pêr'cha; Malay name, meaning 'gum-tree'), a substance resembling caoutchouc in many of its properties, but stronger, more soluble, and less elastic. It is the inspissated milky juice of *Isonandra Gutta* and other kindred trees of the nat. order Sapotaceæ. It chiefly comes from Malacca, Borneo, and other islands of the Indian Archipelago. When pure, gutta-percha is of a brownish-red color. Below the temperature of 50° it is as hard as wood and exceedingly tough. By an increase of heat it becomes more flexible, until at a temperature of 115° F. it becomes pasty, and between this and 140° or 150° it may be molded into all varieties of forms with the greatest ease, retaining precisely the same form as it cools and hardens to its previous state of rigidity. It is insoluble in water, soluble with difficulty in ether and other caoutchouc solvents, but very in oil of turpentine and naphtha. It is not attacked by solutions of alkalies nor by hydrofluoric acid, but it is acted on by sulphuric, nitric, and hydrochloric acids. Gutta-percha has been applied to a variety of purposes: as a substitute for leather, especially in the soles of shoes, etc., as an insulating coating for the copper wires of submarine telegraph cables, as an ingredient in mastics and cements, for the manufacture of flexible hose-tubes, bottles, etc.

Sprig of Gutta-percha Tree.

Guttenberg, a town in Hudson County, New Jersey, on the Hudson River, opposite New York. It has manufactures of chemicals, embroideries, pearl buttons, etc. Pop. 6726.

Guttiferæ (gut-if'e-rē), a natural order of exogenous trees or shrubs, which generally secrete an acrid yellow resinous juice, in some cases of considerable value, as the gamboge yielded by the *Garcinia morella,* or the tacamahaca from the *Populus balsamifera.* They are found in the humid and hot places of tropical regions, chiefly South America. The fruit of some is highly esteemed, in particular the mangosteen and the mammee apple.

Gutzkow (göts'kō), KARL FERDINAND, a German writer, born at Berlin in 1811. After studying theology he took to journalism and politics, and became the leading spirit of a small body of reformers known as 'Young Germany.' In 1835 his novel *Wally die Zweiflerin* appeared. It was at once confiscated by the government as hostile to religion and society, and the author was imprisoned for three months. In spite of government prohibition Gutzkow managed to publish a number of works from Hamburg, where he had settled. Amongst these are: *Blasedow und seine Söhne* (1838), a satire, and *Börne Leben* (1840). He was active, also, in dramatic literature, producing *Richard Savage* (1840), *Patkul* (1841), and *Uriel Acosta* (1847), tragedies, and *Topf und Schwert,* a comedy. He died in 1878.

Gützlaff (gûts'lâf), KARL, a German missionary, born in 1803. He went out as a missionary to the Battas in Sumatra in August, 1826, but settled instead in Batavia, Singapore, and Siam. In 1831 he went to China, acted as British interpreter during the first Chinese war, visited Europe in 1849, and died at Victoria, Hong-Kong, in 1851. His principal works are: *Journal of Three Voyages along the Coast of China in 1831, 1832, and 1833* (London, 1834); *China Opened, or a Display of the Topography, History, etc., of the Chinese Empire* (1838); *Geschichte des Chinesischen Reichs* (Stuttgart, 1847).

Guy (gī), THOMAS, the founder of Guy's Hospital, London, was the

son of a lighterman in Southwark, and born in 1643. He was brought up a bookseller. He dealt largely in the importation of Bibles from Holland, and afterwards contracted with Oxford for those printed at that university; but his principal gains arose from dealings in South Sea stock in 1720. He amassed a fortune of nearly half a million sterling, of which he spent upwards of £200,000 in building and endowing his hospital in Southwark, besides erecting almshouses at Tamworth and supporting various other charities. He was member of Parliament for Tamworth from 1694 to 1707. He died in 1724. See *Guy's Hospital.*

Guyenne. See *Guienne.*

Guy of Warwick, an old English metrical romance, whose hero is an Anglo-Danish knight said to have been the son of Siward, baron of Wallingford, to have become Earl of Warwick, and to have slain in single combat the Danish giant Colbrand, the Dun-Cow of Dunsmore, and the dragon of Northumberland, and many other wonderful feats. He is said ultimately to have become a hermit in Warwick.

Guyon (gē-yōn), JEANNE-MARIE BOUVIER DE LA MOTTE, MADAME, a celebrated mystic, the introducer in France of the system of Quietism, was born at Montargis 13th April, 1648. At the age of sixteen she was married to Jacques Guyon, after whose death in 1676 the tendency to mystic enthusiasm which had characterized her younger years, again acquired ascendency, and she began the religious propagandism of her extreme views of self-abnegation, indifference to life and death, and even to future salvation or perdition. She became associated with some enthusiastic priests, abandoned her children and her goods, reserving a moderate annuity; and moved from place to place, making numerous proselytes. She also published numerous works, such as *Le Cantique des Cantiques interprété selon le Sens Mystique* (1685); *Poésies Spirituelles* (five vols., 1685); *Discours Chrétiens et Spirituels* (1716), etc. At last the Archbishop of Paris thought it necessary to take steps against the spread of Madame Guyon's mystical doctrines. Through his influence she was shut up in the convent of the Visitation, but afterwards released at the instigation of Madame Maintenon, who herself became for a time a convert to the new doctrines, and allowed Madame Guyon to preach in the seminary of St. Cyr, where she made a convert and disciple of Fénelon. A commission of ecclesiastics, chief amongst whom was Bossuet, now sat in judgment, and the doctrines of Madame Guyon were condemned (1695). This led to her being imprisoned for some years, latterly in the Bastille, whence she was liberated in 1702. The rest of her life was spent in retirement and in works of charity. She died in 1717.

Guyot (gē-yō), ARNOLD, geographer and physicist, born in Switzerland in 1807. He studied theology at Berlin, then took up natural science, and became professor of history and physical geography in the Academy of Neufchâtel. He shared in Agassiz's investigations of glacier phenomena of the Alps. In 1848 he emigrated to the United States and delivered lectures in Boston, which afterwards appeared under the title *Earth and Man.* He rendered much service to meteorological science in connection with the Smithsonian Institution. In 1855 he was appointed professor of geology and physical geography in the College of New Jersey, Princeton, where he continued until his death in 1884.

Guy's Hospital, a London hospital, founded in 1723 by Thomas Guy (see *Guy, Thomas*). The original building, completed in 1725 and endowed at a cost of over £200,000, contained accommodation for 400 sick or incurable persons. It has since been improved and enlarged greatly, and is now the largest in London, the beds amounting to 720. Attached to the hospital is an extensive medical school containing lecture-rooms, theaters, museums, and medical library.

Guzerat. See *Gujerat.*

Gwalior (gwä'lē-or), a city and fortress of Hindustan, capital of the state of Gwalior, situated 65 miles south from Agra. The fortress is the largest, the strongest, and the most magnificent in India. It stands on an isolated rock about 350 ft. high and nearly perpendicular in the upper part. The fortress contains wells and reservoirs of water, and is inaccessible except by steps up the side of the rock. Old Gwalior, the town at the northern angle of the base of the rock is built of stone, and has some remarkable ruins of temples and an interesting example of old Hindu palace architecture. The new town, known as New Gwalior or Lashkar (the camp), the residence of the ruler, Maharajah Sindhia, has sprung up recently on the southeastern skirt of the rock, but is already a flourishing city with a pop. of 89,154.—The State of Gwalior, in political relationship with the government of India, consists of sev-

eral portions of territory, otherwise known as Sindhia's Dominions, the largest and most compact portion, usually known as Gwalior, being the one containing the above town and fortress. The total area of Gwalior is about 20,000 sq. miles. Gwalior is not as a whole very fertile; one of its most notable products is opium. The drainage is chiefly taken by the Chambal. Pop. about 3,000,000, mainly Hindus.

Gwyniad GWINIAD (gwin'i-ad; W. from *gwyn*, white). The *Coregŏnus Pennantii*, a fish of the salmon or trout kind found plentifully in some of the Welsh lakes, in Ulleswater, and in

The Fortress of Gwalior.—From an original sketch.

many lakes in Europe. It is gregarious, and may be taken in great numbers at a draught.

Gwynn (gwin), ELEANOR, better known by the name of *Nell*, a celebrated mistress of King Charles II, was at first an orange girl, and also gained her bread by singing from tavern to tavern. About 1667 she became the mistress of Lord Buckhurst, who surrendered her about 1670 to the king. As mistress of the king she had an establishment, and was made lady of the privy chamber to Queen Catharine. She was merry and open-hearted, is said to have been faithful to Charles, mindful of old friends, and a liberal patroness of the poets Dryden, Lee, Otway, and Butler. From her are sprung the dukes of St. Albans. She died, according to some accounts, in 1687, according to others in 1691.

Gyges (gī'jēz), a king of Lydia who reigned, according to Herodotus, B. C. 716-678. He was the favorite of the Lydian king Candaules, who, to convince him of the beauty of his queen, showed her to him naked. The queen was so incensed that she ordered Gyges either to murder the king, ascend his vacant throne, and become her husband, or to atone for his curiosity by death. He chose the former.

Gymnasium (jim-nā'zi-um), the name given by the Greeks to the public building where the young men, quite without clothes (hence the name, from *gymnos*, naked), exercised themselves in leaping, running, throwing the discus and spear, wrestling, and pugilism. Its objects, however, were extended also to the exercise of the mind; for here philosophers, rhetoricians, and teachers of other branches of knowledge delivered their lectures. Gymnasia were at first only open level places, surrounded by a wall, and partitioned off for the different games. At a later date they were composed of a number of connected buildings, spacious enough to admit many thousands. See *Gymnastics*.

Gymnasium, a term applied in Germany to a class of schools in which formerly Latin and Greek, and the branches connected with antiquity, were taught almost to the ex-

clusion of other subjects. A more practical bent is given to the course of instruction in these institutions now, though the *real-schools*, as they are called, are the institutions specially established for high-class education in such branches as mathematics and physical science, history and modern languages. The gymnasia are the feeders of the universities, and the training adopted in them is specially intended to equip the pupils for entering these institutions. The last or exit-examination, to show whether the pupils are fit to enter any of the universities, is very severe, and includes history, Latin and Greek, and at least one foreign language.

Gymnastics (jim-nas'tiks; for derivation, see *Gymnasium*) is the technical term used to designate any system of exercises specially designed to promote the development of physical, and especially of muscular powers. An excellent gymnastic training is given by cricket, football, rowing, and similar amusements, but the special value of formal gymnastic exercises is that they are capable of being scientifically arranged so as to secure not only a general development of muscular power, but also an accurate knowledge of the uses of the various muscles, and further that they are capable of being applied to each individual case, so as to meet, allow for, and as far as possible overcome, defects in physical organization. For these purposes an elementary course of gymnastics is of great value to all, especially to the sedentary student. In regard to gymnastic exercises two general rules may be laid down, which will form an efficient guide in self-imposed exercises. The first is the universal rule in mechanics that the strength of any machine is the strength of its weakest part; the second is the fundamental law of muscular exercise, that it is exercise within the extreme power of the muscle which develops and improves, while straining weakens and injures, and excessive exercise develops particular muscles abnormally at the expense of the general health. It is quite possible, indeed, to carry physical exercises as a whole too far, and to develop muscular power at the expense of vital strength. Till the age of twelve the ordinary games and pastimes of childhood are generally quite sufficient exercise; after that some very light system of gymnastics may be adopted to aid the development of the system. After the age of thirty-five unusual muscular efforts are apt to leave persistent strains, and moderate exercise becomes the safest means of developing and giving tone to the muscular system.

Gymnogen (jim'nu-jen), in botany, a plant with a naked seed. Among gymnogens are pines and firs, yews, joint-firs, the cycads, etc. In the gymnogens there is no proper ovary, the seeds being fertilized by the pollen coming into direct contact with the foramen of the ovule without the intervention of a stigma.

Gymnosperm (jim'nu-sperm), a plant with a naked seed; a gymnogen (which see).

Gympie (gim'pi), a municipal town of Australia, in Queensland, on the side of a range of hills overlooking the river Mary, 116 miles north of Brisbane. It owes its origin to the goldfields here which have yielded good results. The town has some good public buildings, well-paved streets, and is lighted by gas. Pop. 12,000.

Gynæceum (jī-nē'si-um), in botany, the pistil taken in a collective sense, precisely as the stamens form the androecium.

Gynecology (jin-e-kol'ō-ji), that science which treats of diseases peculiar to women.

Gynandria (jī-nan'dri-a), the name given to one of the classes in the artificial system of Linnæus, characterized by having the stamens and pistil consolidated in a single body, as in orchids.

Gynerium (jī-nē'ri-um), a genus of grasses, of which the best known is *G. argenteum* or Pampas Grass (which see).

Gyöngyös (dyeun'dyeush), a town of Hungary, 44 miles N. E. of Budapest; it has manufactures of woolen stuffs, an active trade, and produces the celebrated Erlauer red wine. Pop. 16,442.

Gypaëtus (ji-pā'ē-tus), the genus of birds to which belongs the Bearded Vulture or Lämmergeyer of the Alps (which see).

Gypsies (jip'sēs; from *Egyptians*, the name by which they were called in the English statutes), a wandering nation, whose physical characteristics, language, and customs differ much from those of European nations. They are called by the French *Bohémiens*, from the belief that they were Hussites driven from Bohemia; in Germany the general name is *Zigeuner*, which is not unlike the Italian *Zingari*. They call themselves *Rommany*, from *rom* (man). This race is slowly melting away. Its present total number hardly reaches 500,000; of whom there are about 120,000 in European Turkey; 140,000 in Hungary; 60,000 in Transylvania; 40,000 in Spain; 40,000 spread

over Germany, France, and Italy; 18,000 in Britain, of whom, however, only a small number are tent-gypsies, preserving the language and traditions of their race; and the remainder scattered over other countries. The gypsies are now considered to have come from India, the main body of their language, though mixed with a great number of borrowed words, having a close affinity with some of the Indian languages. Gypsies are remarkable for the yellow brown, or rather olive color, of their skin; the jet-black of their hair and eyes, the extreme whiteness of their teeth, and generally for the symmetry of their limbs. The typical Gypsies rarely settle permanently anywhere, but live in tents, wandering about working in wood and iron, making domestic utensils, telling fortunes, practising tricks, etc. Their talent for music is remarkable, and some of their melodies have become the much-valued property of other nations, or are incorporated in some of our favorite operas. They have no peculiar religion. Amongst the Turks they are Mohammedans; and in Spain, at least, as well as in Transylvania, they follow the forms of the Christian religion, without, however, caring for instruction, or having any real interest in religion. The marriage ceremony is of the simplest kind. If the husband becomes tired of his wife, he will turn her off without ceremony. There is no idea of education amongst them. The children grow up in idleness and the habits of stealing and cheating. The Gypsies first appeared in Germany and Italy about the beginning of the fifteenth century. At that time they wandered about in hordes with a commander at their head. In the Austrian States, where they are very numerous, Maria Theresa formed the plan of converting them into orderly citizens. But her ordinances that they should dwell in settled habitations, practice some trade and send their children to school, remained to a large extent ineffectual. In England the Gypsies first appeared about the beginning of the sixteenth century, and notwithstanding severely repressive enactments on the part of the government continued to maintain themselves as tinkers, mat and basket-makers, etc. In Scotland they were more favorably received, and frequently intermarried with the natives. The town of Yetholm, in Roxburghshire, was once a sort of headquarters for the race, and almost exclusively inhabited by Gypsies. Considerable numbers of the British Gypsies have emigrated to America, where they settle amongst the people and lose their distinctive characteristics. With regard to their language, a large number of the words in all the different dialects are of Indian origin, as already mentioned. The grammar of the tongue is also oriental, and corresponds with the Indian dialects. This similarity cannot be considered the work of chance, particularly as their persons and customs show much of the Hindu character. Amongst the chief authorities in the English language on the subject of the language and origin of the Gypsies are: George Borrow's account of the *Gypsies in Spain* and *Romano Lavosil;* C. G. Leland, the *English Gypsies and their Language;* and Smart and Crofton, the *Dialect of the English Gypsies.*

Gypsum (jip'sum), a monoclinic mineral, chemically a hydrated calcic sulphate ($CaSO_4 2H_2O$). It is found in a compact state as *alabaster*, or crystallized as *selenite*, or in the form of a soft chalky stone, which in a very moderate heat gives out its water of crystallization, and becomes a very fine white powder, extensively used under the name of plaster of Paris (which see). This last is the most common, and is found in great masses near Paris, where it forms the hill of Montmartre, near Aix in Provence, and near Burgos in Spain. Gypsum may be geologically of any age, but occurs abundantly in the more recent sedimentary formations, and is even now forming. When gypsum occurs without water it is called *anhydrite*, but in its most ordinary state it is combined with water.

Gypsy Moth, a small brown moth, *Porthetria Dispar*, common in Europe, where it is not very harmful, and a pest in America since its accidental introduction into New England about 1870. It eats the foliage of trees, sometimes destroying whole forests. Since 1890 extensive public measures have been taken for its extermination, but with little success. The moths live by preference on oaks, apples, gray birch and willows, but will not thrive on white pine. Accordingly, owners of forests where direct control of the pest would be impossible because of the expense are advised to cut down their trees and plant white pine instead.

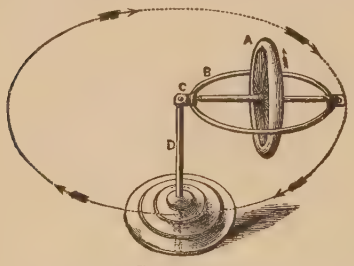
Gypsy-wort, *Lycŏpus Europœus*, a labiate plant found in Britain in ditches and on river banks. It yields a dye said to be used by the Gypsies to render their skin darker.

Gyrencephala (ji-ren-sef'a-la), one of the four subclasses into which Owen divided the mammalia, characterized by having the hemispheres of the cerebrum covering the greater part of the cerebellum and the olfactory lobes. It comprehends the Quadrumana, Carnivora, Artiodactyla, Perisso-

dactyla, Proboscidea, Sirenia, and Cetacea.

Gyrfalcon, or JERFALCON (jer-falkon). See *Falcon.*

Gyroscope (jī'ro-skōp), an apparatus, consisting of a rotating disc mounted by very accurately fitted pivots in a ring or rings (forming a sort of gimbals), for illustrating the properties of rotation generally. The fundamental principle of the whole is the resistance which a disc in rapid motion presents to any change of direction in the axis of rotation. Some curious phenomena may be exhibited by it difficult to explain without resorting to mathematical formulæ. The figure shows a simple gyroscope. If the disc A, which revolves on

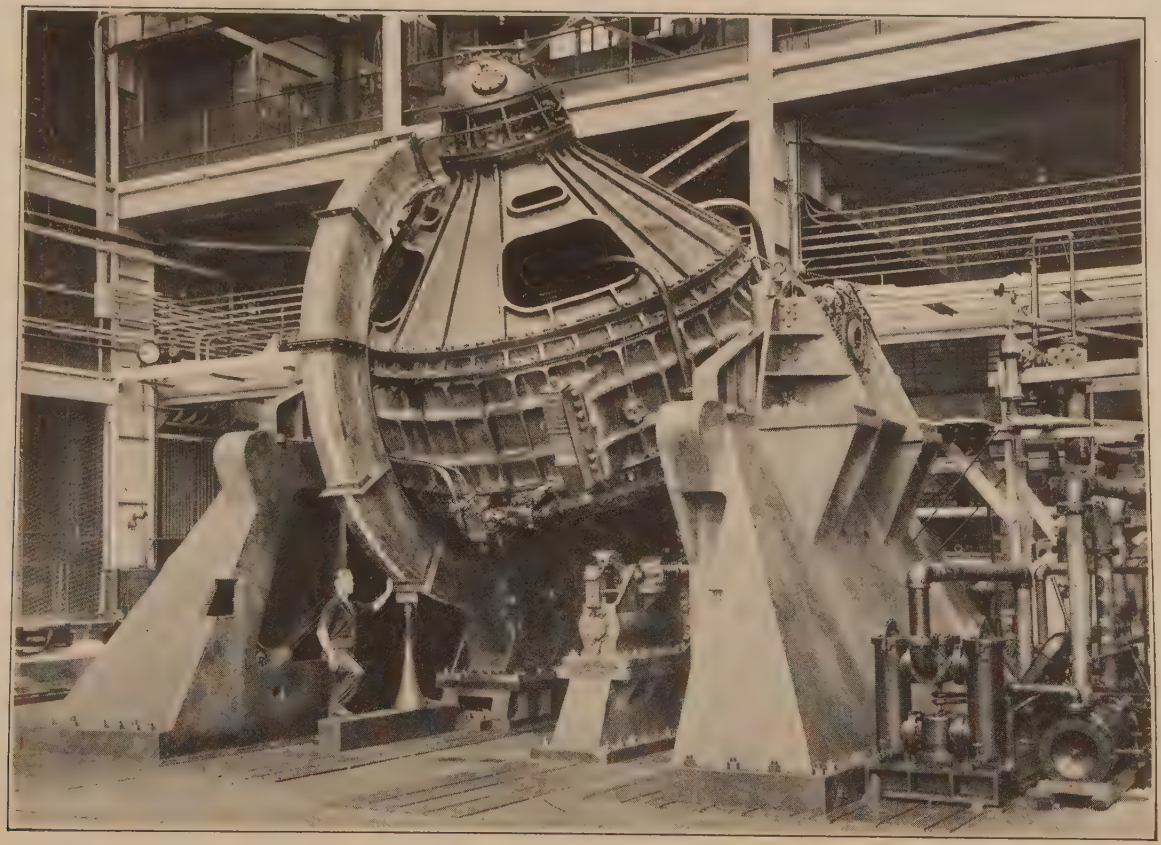


Gyroscope.

an axis within the ring B, is set very rapidly in motion by the unwinding of a string round the axis, and if the part C is then rested on a pivot at the top of the upright support D, the apparatus instead of falling will go slowly round in the direction shown by the arrows. The gyroscope, on a large scale, has been utilized to give steadiness to vessels in rough seas and is considered as applicable to the aeroplane, to keep it on a fixed level. One of the most successful of the recent applications of the gyroscope is in its connection with the marine compass. All battleships in the United States Navy are fitted with the gyro compass. As a gyro compass is independent of the magnetism of the earth and of the ship, and, when running properly, always points to the North Pole, its great convenience in vessels carrying heavy guns and armor is at once apparent. Another important use of the gyroscope is found in its relation to the naval torpedo, especially the Whitehead pattern. Its first application to this purpose was made by an officer in the Austrian navy in 1895, and this device or an improved modification of it, such as the Angle Gyroscope invented by Lieut. W. I. Chambers, of the United States Navy, is in use on all torpedoes. See *Torpedo.* Another interesting application of the gyroscope is in the Gyroscope Railway, which see.

Gyroscope Railway, a railway with a single line of rails, on which the car is kept erect by the steadying power of a pair of heavy gyroscopes, or fly wheels, rotating in opposite directions at very high velocity. There are two recent inventions of this kind, an English and a German, practically the same in character. The English, the invention of an Australian named Brennan, had its first form in a model, a small car on which the gyroscopes rotated at the enormous speed of 7500 revolutions per minute. They were hung in special bearings and rotated in a partial vacuum, the friction being so slight that the wheels would continue to revolve and give stability to the car for a considerable time after the power was shut off. Also, in such a case, supports at the side kept the car from overturning. This model showed itself capable of traveling at high speed on a single rail, rounding sharp curves, and even traversing with ease a wire cable hung in the air. In 1909 a car was tried 14 feet long and 10 wide, capable of carrying 40 passengers. The gyroscopes in this, moved by a gasoline engine, revolved in a vacuum at a speed of 3000 rotations per minute. They were 3½ feet in diameter and weighed together 1½ tons. With a full load of passengers this car sped easily around a circular rail 220 yards long, and proved that it could not be upset, since when all the passengers crowded to one side the car remained firmly erect, the gyroscopes lifting it on the weighted side. It is claimed that in the monorail system a speed of more than 100 miles an hour is safely possible. The German invention, displayed by Herr Schorl, a capitalist of Berlin, is in many respects like the English one. The experimental car was 18 feet long and 4 wide, the gyroscopic fly wheels being very light, weighing but 125 pounds each, while their speed of rotation was 8000 per minute. The same success was attained as in the English experiments, and there seems to be a successful future before this interesting vehicle of travel.

Gyula-Fehérvár. See *Carlsburg.*



BALANCING A BIG LINER AT SEA

To prevent the rolling of a ship and banish the fear of seasickness, the principle of the gyroscope has been successfully applied. This picture shows the huge gyro-stabilizer installed on the U. S. S. *Hawkeye State*. Although weighing 120 tons, the huge spinning top is so delicately balanced that a roll of one degree will bring into effect the great stabilizing power of the machine and prevent a roll of two

H

H, the eighth letter of the English alphabet, often called the *aspirate*, as being a mere aspiration of breathing, though not the only aspirated letter in English. The sound that distinctively belongs to it is that which it has at the beginning of a syllable before a vowel, as in *hard, heavy.* It is very commonly joined to other consonants to represent sounds for which there are no special letters in the alphabet, as in the digraphs *ch, sh, th* (*child, ship, thin, this*), or in other consonantal combinations of various origins and values, as in the words *enough* (*gh*=*f*), *plough* (*gh* silent), *philosophy* (*ph*=*f*, *rhetoric* (*h* silent), etc. *Ch* is common in words taken from the Greek, but in this case it generally has the *k* sound, as in *chemistry, chyle, logomachy,* etc. See *Grimm's Law.*

Haakon VII. See *Hakon VII.*

Haarlem (här'lem), a town of Holland, province N. Holland, 10 miles W. of Amsterdam, intersected by the Spaarne, which is joined by canals from Leyden and Amsterdam, and along which a considerable traffic is maintained. The town is well and regularly built; the streets exceedingly clean, planted with trees, and laid out in promenades. Among the notable buildings are the town-hall, the church of St. Bavon with its celebrated organ, the Prinsenhof, in which the provincial assembly meets. The manufactures of Haarlem, as well as its population, are less than what they were formerly; but it has still various industrial works, a celebrated type-foundry, the oldest and most famous printing-office in Holland, while its flower trade, especially in hyacinths and other bulbs, is very important. On the south side of the town is the park of Haarlem, a plantation of fine old beeches surrounded with villas, cafés, and places of holiday resort. Haarlem was a prosperous place as far back as the twelfth century. During the revolt of the Netherlands it sustained a famous seven months' siege by the Spaniards. It is the birthplace of Laurence Coster, and of the painters Ostade, the Wouvermans, Ruisdael, etc. Pop. 70,491.

Haarlem (här'lem), LAKE OF, a former lake of Holland, adjoining and communicating with the Y, between Haarlem and Amsterdam. Previously a swamp, it was formed in the fifteenth century by the overflow of the Rhine and the crumbling away of the banks of the Y, and imperiled by its growth the towns of Haarlem, Amsterdam, and Leyden. It was 18 miles long, 9 miles broad, and about 14 feet deep. The draining of it was commenced in 1840, and completed in 1853. The soil thus reclaimed, known as the Haarlemmer Polder, now forms a commune, which numbers over 16,000 inhabitants.

Habakkuk (hab'a-kuk, or ha-bak'-uk), the eighth of the twelve minor prophets. He flourished about 600 B.C. at the time of the invasion of Judah by the Chaldeans, against whom he prophesies God's retributive justice. He concludes with a kind of psalm (chap. 3) remarkable for the majesty of its language and the sublimity of its thought.

Habberton (hab'ĕr-tun), JOHN, author, born at Brooklyn, New York, in 1842. He served as an officer in the Civil war, 1862-65, and afterwards became a journalist and novelist. His *Helen's Babies* (1876) was a very popular story. Other books are: *The Worst Boy in Town, Who Was Paul Grayson, A Lucky Lover.*

Habeas Corpus (hā'be-as kor'pus), in law, a writ addressed to one who has a person in custody, commanding him to produce the body of the person named at a certain place and time. From the time of the Magna Charta imprisonment at the discretion of any person has been unlawful in England, but for long the royal prerogative was so indefinite and the power of the crown so great that persons were frequently detained in custody at the discretion of the crown. It was not till 1679 that the Habeas Corpus Act provided the great remedy for the violation of personal liberty by the writ of *habeas corpus ad subjiciendum* (that you have the body to answer). The provisions of the act may

be stated generally thus:—1. That on complaint or request in writing, by, or on behalf of, any person committed and charged with any crime (unless treason, felony, etc., expressed in the warrant), the lord-chancellor, or any of the judges shall award a habeas corpus for such prisoner, and shall discharge the party, if bailable, upon security being given to appear and answer to the accusation. 2. The writ shall be returned, and the prisoner brought up within a limited time, not exceeding twenty days. 3. No person once delivered by habeas corpus shall be recommitted for the same offence. 4. Every person committed for treason or felony may insist on being tried at the next assizes, or admitted to bail, and if not tried at the second assizes or sessions, he shall be discharged from the imprisonment. The English statute has been copied in the United States without essential change. It is the grandest safeguard against despotism which jurisprudence affords. In the days of slavery the writ was often issued in behalf of slaves who had escaped from their masters, and when it was shown that the masters had brought them into a free state the court set them free. So important was the writ of habeas corpus considered by the framers of the constitution of the United States that they inserted an express provision (art. I, sec. 9) that it should not be suspended 'unless when in cases of rebellion or invasion the public safety may require it.' The question whether the power to suspend is vested in Congress or the President, or in each alike, is a disputed point. During the Civil war the power was exercised by the president, with the tacit consent or express permission of Congress. No state court has a right to issue the writ for the discharge of a person held under the authority of the federal government. The proceedings upon a return of a writ may take place in chambers before a single judge, or before several judges in open court, as determined by the language of the writ.

Habergeon (ha-bėr'jun), a jacket of hain-mail shorter than the hauberk, and without sleeves, worn during the middle ages by the squires and archers.

Habibulla Khan, Ameer of Afghanistan, born at Cabul in 1872, succeeded his father, Abdur Rahman Khan, October 3, 1901.

Habitants, or HABITANS, a name applied to the inhabitants of Canada, especially in Quebec province, who are of French extraction and still speak the French language and preserve French customs. See *Canada*.

Hackberry (hak'ber-i), the popular name of North American varieties of the nettle-tree, *Celtis crassifolia*, also of the *Celtis occidentalis*, belonging to the nettle family Urticaceæ.

Hackensack (hak'en-sak), county seat of Bergen Co., New Jersey, on Hackensack River, 12 miles N. of New York. It has paper mills, iron works, wall paper and silk factories; also the Johnson Public Library. Pop. (1910) 14,050; (1920) 17,677.

Hackländer (hâk'len-dėr), FRIEDRICH WILHELM VON, a German novelist and comedy writer, born in 1816. He engaged first in commerce, then entered the Prussian artillery, and commenced his literary career in 1841 with *Pictures from a Soldier's Life in Time of Peace*. He then became successively private secretary to Baron Taubenhein, whom he accompanied to the East, and to the Crown Prince of Würtemberg. In 1849 he served with the Austrians during the war with Sardinia, and published his observations in *Soldier Life in Time of War*. He was ennobled by the Emperor Francis Joseph. He died in 1877. Amongst his many writings distinguished by a mixture of pathos and humor, we may mention *Daguerreotypen* (1842), *Handel und Wandel* (1850), *Der Neue Don Quixote* (1858), *Geschichten im Zickzack* (1871); of his comedies, *Der Geheime Agent* (1850) was the most successful.

Hackmatack (hak'ma-tak), a term applied in many parts of the United States to the American larch. See *Larch*.

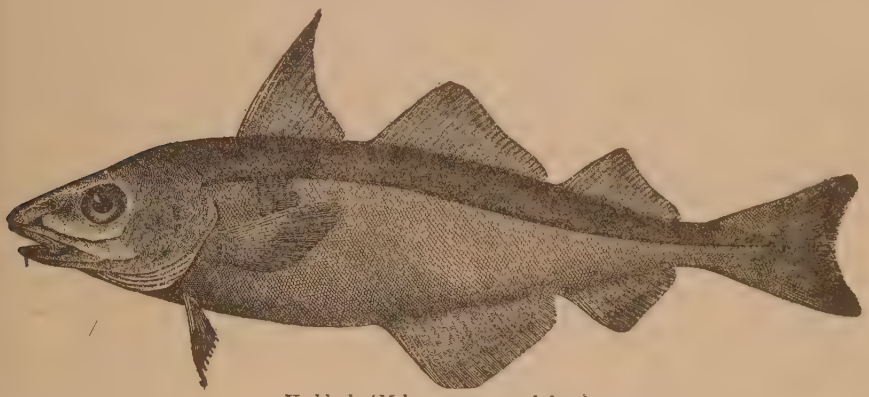
Hackney (hak'nē), a suburb of London, in Middlesex, 3 miles N. N. E. of St. Paul's. It includes Hackney proper, South Hackney, Homerton, Clapton, Dalston, etc., and is a favorite residence of wealthy merchants. Pop. 222,587.

Hackney Coach, a coach let out for hire. Hackney coaches began first to ply under this name in London in 1625, when they were twenty in number. Hackney coachmen are generally put under police regulations, and a tariff of fares imposed upon them. Cabs are now the common kind of hackney coaches.

Haddington (had'ing-tun), a burgh of Scotland, capital of the county of same name, 17 miles east by north of Edinburgh, on the Tyne. The town has a Gothic church of the eleventh or twelfth century. Its grain market is one of the largest in Scotland. Pop. 4053.—The county, also called EAST LOTHIAN, is bounded by the Firth

of Forth, the German Ocean, Berwickshire, and Midlothian; area, 280 square miles, of which four-fifths are arable or fit for cultivation. The Lammermuir Hills yield coal, iron, and limestone. Fishing and fish-curing are carried on at Dunbar and other points. Pop. 38,662.

Haddock (had'uk), a well-known fish of the cod family (Gadidæ), *Morrhua* (*Gadus*) *æglefinus*. It is smaller than the cod, which it much resembles, but it has a dark spot on each side of the body just behind the head. This fish commonly weighs from 2 to 6 lbs., though sometimes as high as 10 lbs.



Haddock (*Melanogrammus æglefinus*).

It breeds in immense numbers in the northern seas in February and March, and constitutes a considerable article of food. It is plentiful on the coasts of America, from New York to the Arctic regions.

Haddonfield, a residential borough of Camden Co., New Jersey, 6 miles S.E. of Camden, with some manufactures. Pop. (1920) 5646.

Hades (hā'dēz), originally the Greek name of the lord of the lower or invisible world, afterwards called Pluto; but in later times, as in the Greek Scriptures, it is applied to the region itself. With the ancients Hades was the common receptacle of departed spirits, of good as well as bad.

Hadji (ha'jē), the Mohammedan pilgrimage to Mecca, which every Mohammedan ought to perform once in his life, and after which he is entitled to prefix *Hadji* to his name. The pilgrimage was made in disguise by Burckhardt in 1814, by Burton in 1853, and by T. F. Keane in 1878, each of whom published accounts of his journey.

Hadji Khalifah (ha'jē kal'i-fa), the surname of Mustapha-Ben-Abdallah, a Turkish historian, born at Constantinople about 1605; became 'first secretary' to Sultan Mourad IV, and died at Constantinople in 1658. His most important work is *Keshf-ul-tzunûn*, a kind of encyclopædia of Arabic, Turkish, and Persian literature. Among his other works are *Chronological Tables*, *Mirror of the World*, and *History of the Maritime Wars of the Turks*. All the works mentioned above have been translated into Latin and modern languages.

Hadley (had'li), ARTHUR TWINING, an American educator; born in New Haven, Connecticut, in 1856. He graduated at Yale College in 1876; became professor of political science in 1886 and president of Yale University in 1899. He accepted the Roosevelt professorship at Berlin, 1907-08.

Hadley (had'li), JOHN, an English astronomer, born towards the end of the seventeenth century. He is the reputed inventor of the quadrant that goes by his name, though the honor is also claimed for Newton, from whom Hadley got a description of the instrument in 1727, and for Thomas Godfrey, of Philadelphia, who produced his instrument about the same time as Hadley, in 1731. The Royal Society decided that Godfrey and Hadley were both entitled to the honor of the invention. Hadley also invented the sextant. He died in 1744.

Hadramaut (hä-drä-mą'), a district of Arabia which, in the older and wider use of the term, extended from Yemen on the west to Oman on the east, and from the Indian

Ocean on the south to the great desert of El Ahkaf on the north. The name is, however, generally confined by the natives to a much smaller tract in the southwest. There are some fertile valleys and glens, one of the most important being that of the Wadi-Doan, where the slopes of the mountains are covered with towns and villages, and grain crops, dates, indigo, bananas, etc., are extensively cultivated. On the coast Makallah is the chief commercial depôt.

Hadrian (hā'dri-an), in full, PUBLIUS ÆLIUS HADRIANUS, the fourteenth in the series of Roman emperors, born at Rome, 24th Jan., 76 A.D. His father, who was cousin to the Emperor Trajan, died when he was ten years old, and left him under the charge of his illustrious kinsman. He married Sabina, Trajan's grandniece, accompanied the emperor on his expeditions, filled the highest offices of state, and, on the death of Trajan, assumed the government as his adopted son (117). He made peace with the Parthians, renouncing all conquests east af the Euphrates, and bought off a war with the Roxolani by payment of a sum of money. From the year 121 he spent most of his time in visiting the various provinces of the empire. Hadrian's policy was a peaceful one, because he saw that the further extension of the empire only weakened it. Although avoiding war as much as he could, he kept the armies in excellent condition, fortified the frontiers in Germany, and, crossing over into Britain, constructed the wall known as Hadrian's Wall (or that of Severus), which protected the Roman province from the barbarous tribes of the north. He next traveled into Asia and Africa, and lived in Athens for three years. In 131 he promulgated the Edictum Perpetuum, a fixed code of laws, which forms an important epoch in the development of Roman law. In 132 the Jews began a revolt, and for four years carried on a bloody war, the only notable one of his long reign. Hadrian died at Baiæ in 138.

Coin of Hadrian.

Hadrian's Wall, or the PICTISH WALL, a wall quite as often associated with the name of Severus. See *Severus (Wall of)*.

Hadrosaurus (ha-dro-sa'rus), a genus of large extinct reptiles, whose remains have been found in the newer cretaceous strata of the United States. A fine example, found in New Jersey, is in the Philadelphia Academy of Natural Sciences. It appears to have resembled the gigantic iguanodon of Europe in its enormous dimensions, herbivorous habits, and anatomical structure.

Hæckel (hek'l), ERNST, a German naturalist, born at Potsdam in 1834, studied medicine and science at Berlin, Würzburg, and Vienna; traveled in Norway and Italy, became professor of zoology at Jena in 1865. Later he visited Spain, Egypt, India, and Ceylon to perfect his knowledge of natural forms. He is the most prominent exponent of the Darwinian theories and of the doctrine of monism in Germany. Among his works may be mentioned *The Radiolariæ* (1862), *The History of Creation* (1868), *Anthropology* (1874), *History of the Evolution of Man* (1875), *Riddle of the Universe* (1902), *and Wonders of Life* (1905). He died August 9, 1919.

Hæmal Cavity (hē'mal), in anatomy, a term applied to the cavity which contains the great centers of circulation in the Vertebrata, together with the digestive and respiratory apparatus. The *Hæmal Arch* is the arch formed by the projections anteriorly of the ribs and the sternum from the vertebræ.

Hæmatemesis (hē-ma-tem'e-sis), a vomiting of blood from the stomach, resulting from some disease of the stomach, as ulcer or cancer.

Hæmatin HEMATINE (hē'ma-tin), the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

Hæmatite (hē'ma-tīt), RED AND BROWN. See *Hematite* and *Iron*.

Hæmatopus (hē-mat'o-pus), a genus of wading birds, the best known species of which is *H. ostralĕgus*, or common oyster-catcher.

Hæmatoxylin (hē-ma-toks'i-lin; $C_{16}H_{14}O_6$), the coloring matter of logwood, or *Hæmatoxylon campechianum*. This coloring matter is a constituent part of all the colors prepared with logwood, and the changes which it undergoes by the action of acids and alkalies render it useful as a reagent to detect their presence.

Hæmatozoa (hē-ma-tō-zō'a; Gr. *haima*, blood, and

zōon, a living creature), a name given to the parasitic animals which, under certain conditions, exist in the blood of mammals, birds, reptiles, fishes, and many invertebrate animals. They are generally microscopic, and are thought to be connected with various diseases.

Hæmaturia (hē-ma-tu'ri-a; Gr. *haima*, blood, and *ouron*, urine), a discharge of bloody urine, usually arising from disease of the kidneys or bladder. In some parts of Africa it is an endemic disease arising from a parasite in the blood.

Hæmoglobin, HÆMOGLOBULIN (hē-mo-glob'ū-lin), the semifluid or quite fluid matter of a red color contained in the red corpuscles of the blood. It can be resolved into an albuminous substance called globulin and the coloring matter hæmatin.

Hæmoptysis (hē-mop'ti-sis; Gr. *haima*, blood, and *ptysis*, a spitting), the coughing up of blood, sometimes produced by fullness of the blood vessels of the lungs or throat, or by the rupture of blood vessels as a consequence of ulceration. It is distinguished from blood coming from the stomach by the comparative smallness of its quantity, and by its usually florid color. It occurs in heart disease, in pneumonia, and tubercular disease of the lungs. It is sometimes a case of vicarious menstruation.

Hæmorrhage. See *Hemorrhage.*

Hæmorrhoids. See *Hemorrhoids.*

Hæmus (hē'mus), in ancient geography, the chain of mountains now known as the *Balkan.*

Hafid (hä'fid), MULAI, Sultan of Morocco, born in 1873, the half brother of Sultan Abdel Aziz, educated at University of El Azaar, Cairo. He was viceroy of Southern Morocco for seven years, and in 1907 put himself at the head of the rebellion against Sultan Aziz, whose course of life had caused great dissatisfaction. After a struggle lasting about a year the revolution succeeded, Aziz was dethroned, and Hafid proclaimed sultan, February 11, 1908.

Hafiz (hä'fiz), MOHAMMED SHEMS ED DIN, one of the most celebrated and most charming poets of Persia, was born at Shiraz in the beginning of the fourteenth century. He studied theology and law, sciences which, in Mohammedan countries, are intimately connected with each other. He preferred independent poverty as a dervish to a life at court, whither he was often invited by Sultan Ahmed, who earnestly pressed him to visit Bagdad. He died at Shiraz about 1390. His poems, known collectively as the *Divan*, are Anacreontic in sentiment, abounding in the praise of love and wine.

Haggar. See *Ahaggar.*

Hag, the name of the fishes of the genus *Myxine*, which, with the allied lampreys, constitute the order of Marsipobranchii. They are of worm-like form, and have no eyes or scales. The mouth is formed for suction, is without lips, and furnished with fleshy filaments or barbels. There is a single median fang upon the palate, by means of which the hag makes its way into the interior of other fishes, such as the cod, ling, or haddock, where it lives parasitically. The *Myxine glutinōsa*, or common hag, takes its name from the quantity of viscid mucus which it can secrete. An American species is not uncommon in rivers of New York and New England.

Hagen (hä'gen), a thriving manufacturing town of Prussia, in Westphalia, at the confluence of the Volme and Ennepe. It has manufactures of woolen, linen, and cotton cloth, leather, hats, steel, and ironware. Pop. 88,605.

Hagenau (hä'ge-nou), a town of Lower Alsace, 18 miles N. of Strasbourg, on the Moder. It has manufactures of woolen goods, shoes, wine, etc. In 1673 it was given to France; in 1871 to Germany; in 1918 returned to France. Pop. 18,868.

Hagerstown (hā'gers-toun), a city, county seat of Washington Co., Maryland, in the N. W. section, on 4 railroads. It has car shops, organ and furniture factories, textile mills, leather and metal-working industries, automobile factories, etc. Pop. (1910) 16,507; (1920) 28,066.

Haggai (hag'ā-ī), the tenth in order of the minor prophets, and first of those who prophesied after the captivity. The book of Haggai consists of four distinct prophetical addresses—two in the first and two in the second chapter—intended to rouse his disheartened countrymen to the rebuilding of the temple. They were delivered in 520 B.C., and are written in a brief style. The closing prediction foreshadows the establishment of the Messianic kingdom.

Hagiographa (hā-ji-a'gra-fa), a term from the Greek, meaning in general holy writings, but specifically applied to the writings included in the Jewish Ketubim, or third division of the Scriptures. See *Bible.*

Hagiology (hā-ji-o'lo-ji), that branch of literature

which has to do with the history of the lives and legends of the saints.

Hague, THE (hāg; Dutch, *'S Gravenhage* — the Count's Hedge; French, *La Haye*), practically, though not formally, the capital of the Netherlands, in the province of South Holland, 33 miles southwest from Amsterdam, and within 3 miles of the sea. It is the residence of the queen and of the foreign ambassadors, and the seat of the States-General of the Netherlands. It is pleasantly situated, and is distinguished for width and straightness of streets, and general elegance of public buildings. Among the most important structures are the royal palace, the palace of the Prince of Orange, the Binnenhof, a large irregular building, founded in 1249, and containing the hall of assembly of the States-General, and various government offices; also the provincial government house, a large roomy edifice, the town hall, royal library (200,000 vols.); the Groote Kerk, or Church of St. James, with hexagonal tower and finely vaulted interior; the Mauritshuis, built by Prince John Maurice of Nassau, now converted into a museum containing some of the finest works of the Dutch masters. To these has recently been added the so-called 'Palace of Peace,' built by Andrew Carnegie for the meetings of the International Peace Conference. There are some manufactures—iron, ordnance, gold and silver wares, hats, furniture, etc.—but the town mostly depends on the presence of the court and the numbers of strangers that come for sea-bathing to Scheveningen, about 3 miles distant. The population in 1900 was 212,211; it had increased to 294,693 in 1913.

Hague Tribunal. See *Peace, International.*

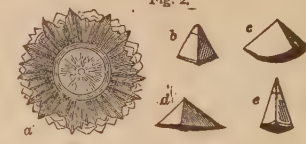
Hahnemann (hä'nē-mân), SAMUEL CHRISTIAN FRIEDRICH, the founder of the homœopathic system, born at Meissen in 1755; studied medicine at Leipzig, Vienna, and Erlangen, taking his degree at the last-mentioned place in 1779. After practicing in various places, he published in 1810 his *Organon der rationellen Heilkunde*, which fully explained his new system of curing any disorder by employing a medicine which produces a similar disorder. (See *Homœopathy.*) Hahnemann was driven from Saxony by the government prohibiting him from dispensing medicines, but found an asylum ultimately in Paris, where his system was authorized by the government and acquired a certain popularity. In its developed form it now ranks among the prominent schools of medicine. He died at Paris in 1843.

Haig, SIR DOUGLAS, British general, born in Fifeshire in 1861, entered the hussar service in the army in 1885 and took part in 1888 in the Sudan campaign under Kitchener. In the Boer War he served as a staff officer and won repute for skill and courage, reaching the rank of lieutenant-colonel. He was inspector general of cavalry in India in 1903 and major general in 1904, was chief of staff in India 1909–13, and in 1914 was made commander of the First Army on the France-Belgium line. He showed brilliant powers on the Aisne and at Ypres and in 1916 succeeded General French as commander-in-chief of the British forces in France.

Hail (hāl), small masses of ice or frozen rain falling from the clouds in showers or storms, varying in their form, being either angular, pyramidal, or stellated, as well as in their consistency, being sometimes as hard as ice and sometimes as soft as snow. At the center there is generally an opaque spongy mass, resembling sleet in its composition, and round this a semi-transparent congealed mass, consisting of a succession of layers or strata, is formed. Properly there are two kinds of hail—the small grains which generally fall in winter and usually before snow; and the large hail which occurs chiefly in spring and summer, and is most severe in very hot climates. The small-grained hail is probably formed by the freezing of raindrops as they pass in falling through colder air than that from which they started. The large or common hail is probably due to the meeting of two currents of air, of very unequal temperature and electric tension. The usual size of hailstones is about ¼ inch in diameter, but they are frequently of much larger dimensions, sometimes even 3 or 4 inches

Fig. 1.

Fig. 2.



FORMS OF HAILSTONES.

Fig. 1. *a*, Hailstone which fell at Bonn in 1822: diameter 1½ inches, weight 300 grains. *b c*, Sections of differently shaped Hailstones which fell on the same occasion. Fig. 2. *a*, Section of Hailstone with minute pyramids on its surface. *b c d e*, Fragments of same when burst asunder.

in diameter. In hot, and even in temperate climates they are often very destructive to crops.

Hailes, Lord. See *Dalrymple (Sir David)*.

Hainan (hī'nän), an island of China, belonging to the province of Quang-Tung, between the China Sea and the Gulf of Tonquin, and separated from the mainland by a channel of 15 miles, encumbered with shoals and coral reefs. It is almost oval in shape, and has an area of over 16,000 square miles. The fertile lowlands on the northern and western coasts are occupied by immigrant Chinese, to the number of about 1,500,000, who cultivate rice, sugar, tobacco, etc. The fisheries are also productive. The interior, which is mountainous and covered with forests, is inhabited by a distinct race still in a very primitive stage. The capital is Kiang-chow, on the northern coast, a large seaport.

Hainaut, or Hainault (ā-nō; Dutch, *Hennegowen;* German, *Hennegau*), a province of Belgium, bounded on the south and west by France; area, 1406 square miles. Though nowhere properly mountainous, it is very hilly in the southeast, where it is covered by the Western Ardennes. In other directions it is generally flat, though well diversified. About three-fourths of the whole surface is arable, and scarcely a hundredth part is waste. The soil is generally fertile, and there are extensive coal fields, coal, together with flax, linen, hemp, tobacco, and porcelain being the chief articles of export. Manufactures, chiefly cutlery, woolen and linen goods, etc., are carried on to a great extent. The capital is Mons. Population, 1,146,646. The old province of Hainault, in Cæsar's time the native district of the Nervii, was in the tenth century governed by a race of counts, the succession of which continued unbroken till 1436, when Jacqueline, heiress of William IV, was forced to cede her lands to Philip, duke of Burgundy. With Mary of Burgundy, Hainault passed to the house of Austria, but in 1659 a part of it was ceded to France, and is now included in the department of Nord.

Hainburg, or Haimburg (hīn'burh, hīm'burh), a town of Lower Austria, beautifully situated on the Danube, 27 miles southeast of Vienna. It is walled; has an ancient town house, remains of a Roman aqueduct, and other antiquities. The old castle on the height is the Heimbure of the Nibelungenlied, the old frontier fortress of the Huns. Pop. 6225.

Hainichen (hī'nih-en), a town of Saxony, 41 miles southeast of Leipzig. It has manufactures of woolen, linen, and cotton cloth, and is the chief seat of the German flannel manufacture. Pop. 7932.

Hair (hār), the fine, threadlike, more or less elastic substance, of various form and color, which constitutes the covering of the skin in the class of mammalia. It has the same use as feathers in birds, and scales in fishes and reptiles. No species of mammalia is without hair in an adult state, not even the Cetacea. In quadrupeds it is of the most various conformation, from the finest

Hairs of Various Animals Magnified.
A, Indian bat. B, Mouse. C, Sable. D, Human.

wool to the quills of a porcupine or the bristles of the hog. The human body is naturally covered with long hair only on a few parts; yet the parts which we should generally describe as destitute of it produce a fine, short, colorless, sometimes hardly perceptible hair. The only places entirely free from it are the palms of the hands and the soles of the feet; but the body of the male often produces hair like that of the head on the breast, shoulders, arms, etc. Each hair consists of a shaft and a root. The shaft or part outside the skin does not grow; but the root embedded in the skin expands at its lower end into a swelling or bulb which is composed of little cells and grows by forming new cells, the old ones being pressed forward and becoming part of the shaft. The color is due to minute pigment granules in the cells of the hair. The color of the hair is a race character; and the shape of the shaft has likewise been used in this way, transverse sections showing circular, oval, flat, or reniform outlines. The human hair varies according to age, sex, country, and circumstances. At birth an infant generally has light hair. It always grows darker and stiffer with age. The same is the case with the eyelashes and eyebrows. At the age of puberty the hair grows in the armpits, etc., of both sexes, and on the chin of the male. The hair of men is stronger and stiffer; that of

females longer (even in a state of nature), thicker, and not so liable to be shed. Connected with the hairs are small glands which secrete an oily substance, serving as a lubricant to the skin as well as the hair. These are called sebaceous glands. If the root is destroyed there is no means of reproducing the hair; but if it falls out without the root being destroyed, as is often the case after nervous fevers, the hair grows out again of itself. Each hair, indeed, lasts only a certain time, after which it falls out and is replaced by another as long as the papilla is not weakened. Grayness of hair is caused by a deficient amount of pigment granules in the hair cells. The deficiency arises at the hair bulb where the cells are produced. Any influences that affect the nutrition of the bulb may thus affect the color as well as the growth of the hair. Baldness is caused by atrophy of the papilla, generally due to lessened circulation of the blood in the scalp. For some diseases which have a close connection with the hair, see *Plica Polonica*, *Ringworm*, *Sycosis*. Under ordinary circumstances hair is a very stable substance. It is the last thing which decays, and it often grows after death and lasts for centuries. Hair is not acted on by water, but heated in it under pressure it decomposes, evolves sulphuretted hydrogen, and dissolves; it is also dissolved by alkalies and acids. When burned it emits a disagreeable odor as of burning horn.

Hair for manufacture is furnished chiefly from the horse, the ox, the hog, the goat, especially the Angora or Mohair goat, the camel, and the alpaca. That of the first three is most used for upholstery purposes, the short hair being manufactured into curled hair for stuffing, and the long straight hair manufactured into hair-cloth for seating. The long hair is also reserved for the manufacture of fishing-lines, brushes, etc. White hair is of the most value, being most adapted for dyeing and for the manufacture of fancy articles. The horse-hair used for weaving comes chiefly from Russia, Germany, Belgium, South America, and Australia. Russia chiefly furnishes the bristles, so largely used for brushes. The sable, the minniver, the marten, the badger supply the finer brushes or hair-pencils of painters. The hair of the goat, the camel, and the alpaca is chiefly used in combination with or subordinated to wool and other fibers for spinning and weaving into dress fabrics. The kind of hair most used in manufacture is the fleecy coat, or soft hair of the sheep, known as wool (*q. v.*). Human hair is used chiefly for the manufacture of wigs, curls, beards, chignons, etc. Most of the supply comes from France, Germany, and Italy, where the peasant girls sell their hair to itinerant dealers. In every case, and for any purpose, hair is always best taken from the healthy living subject, hair of diseased and dead people being much inferior.

Hair-dyes, substances for giving hair some particular color desired. The numerous preparations sold for this purpose have generally a basis of lead or nitrate of silver. Bismuth, pyrogallic acid, sulphur, the juice of green walnut shells and other astringent vegetable juices, are also employed.

Hair-eel, the living form into which horse-hairs, when left to soak in running water, are supposed by many to develop. The horse-hair worm or hair-eel is really a Nematode. See *Nematelmia*.

Hair-grass (*Aira*), a genus of grasses belonging to that division of the order in which the spikelets have two or more florets, and the inflorescence is a loose panicle. It is of little use for cattle, which dislike it, but may serve where covert is wanted for game. *A. cæspetōsa*, or tufted hair-grass, the windlestrae of the Scotch, is used as thatch for ricks, and in some places for making mats.

Hair-powder, a preparation of pulverized starch and some perfume, formerly much used to whiten the head. Sometimes the powder was colored. The custom of wearing it was introduced from France into England in the reign of Charles II. To make the powder hold, the hair was usually greased with pomade. It is now scarcely to be seen except on the heads of footmen in attendance on the people of rank or wealth.

Hair-spring, in watches, the fine hair-like spring made of steel, which is attached to the axle of the balance wheel, and serves by its resisting power to equalize the vibrations of the escapement-wheel.

Hair-tail (*Trichiurus*), a genus of acanthopterous fishes, of the tropical marine fauna, generally found near land. The body is long, scaleless, ribbon-shape, and ends in a long, whip-like tail. The dorsal fin extends along the whole back and is spiny throughout. There are six species known, some of them being four feet long. The Dilvery Hair-tail, or Ribbon-fish, is found in the Atlantic, along the east coast of the United States from Cape Cod to Florida and in the West Indies. The others are found in Pacific waters.

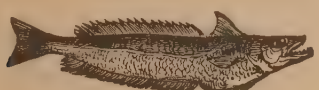
Hair-worms. See *Nematelminthes.*

Haiti. See *Hayti.*

Hajilij (hä'ji-lij), an Egyptian, Indian, and African tree of the genus *Balanites* (*B. Ægyptiaca*), nat. order Simarubeæ, cultivated for its edible fruit, from the seeds of which an oil is expressed.

Hajipur (hä-jē-pör'), a town of India, in the Muzaffarpur District, Bengal, on the Little Gandak, a short distance above its confluence with the Ganges. Its command of water traffic gives it considerable commercial importance. Pop. about 20,000.

Hake (hāk), the *Merlucius vulgāris* of Europe, and the *M. albidus* of N. America, fishes belonging to that



Hake (*Merlucius vulgāris*).

division of the cod family or Gadidæ, which has the head much flattened, and two dorsal and one long anal fin. The European hake is known in some places as king of the herrings, on which it preys.

Hakim (ha'kim), a Turkish word, originally signifying *sage, philosopher,* and then a *physician. Hakim bashi* is the physician of the sultan, that is to say, the chief of the physicians, always a Turk; whilst the true physicians in the seraglio under him are Western Europeans, Greeks, and Jews.

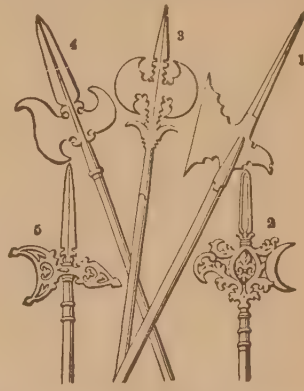
Hakluyt (hak'löt), RICHARD, one of the earliest English collectors of voyages and maritime journals, born in 1553. He entered Christ Church College, Oxford, in 1575, and became so eminent for his acquaintance with cosmography, that he was appointed public lecturer on that science. About 1584 he went to Paris as chaplain to the English ambassador, and stayed there five years. After his return home he prepared for the press his collection of *The Principal Navigations, Voyages, and Discoveries of the English Nation, made by Sea, or over Land, Within the Compass of These 1500 Years.* The first volume, in folio, was published in 1589, and the third and last in 1600. Besides narratives of nearly 220 voyages, these volumes comprise patents, letters, instructions, and other documents, not readily to be found elsewhere. Hakluyt died in 1616, and was interred in Westminster Abbey.

Hakodadi (hä'kō-dä'de), or HAKODATE, a city of Japan, near the south end of the island of Yesso, at the foot of a hill on the shore of a beautiful and spacious bay, which forms one of the best harbors in the world. The commerce is important and there are manufactures of matches, etc. The city is strikingly clean, well laid out, and attractive in other particulars. Pop. 78,040.

Hakon VII (hä'kon), Prince Charles of Denmark, was elected by the Norwegian parliament and popular vote (Nov. 12-13, 1905), as the first ruler of the resuscitated kingdom of Norway. He was born in 1872, the second son of Frederick VIII of Denmark, and in 1896 married Princess Maud, third daughter of Edward VII of England. He chose the name Hakon as a revival of the title of a number of ancient kings of Norway.

Halacha (hal'a-ka), HALAKA (Heb. 'rule'), the Jewish oral or traditional law, as distinguished from the written law laid down in the Scriptures, and like it believed to be of divine origin. It was finally reduced to a written code forming part of the *Talmud.*

Halberd, or HALBERT (hal'bert), an offensive weapon, consisting of a pole or shaft about 6 feet long, having its head armed with a steel



HALBERTS.

1, Halbert (Time of Henry VIII). 2, Do. with fleur-de-lis (Henry VII). 3, Double-axed Halbert (Charles I). 4, Halbert (Charles II). 5, Do. (William III).

point edged on both sides. Near the head was a cross piece of steel somewhat in the form of an axe, with a spike or hook at the back. It was much used in the English army in the sixteenth century, and gave its name to troops called *halber-*

diers, to whom was confided the defense of the colors, and other special duties. It is now used only on ceremonial occasions.

Halberstadt (häl-bėr-stät'), a town of Prussia, in the province of Saxony, 32 miles S. W. of Magdeburg, on the right bank of the Holzemme. It is an old town, with many timber-framed and curiously ornamented houses. Its principal buildings are the cathedral, the Liebfrauen church, an old Episcopal palace, town house, etc. It has considerable manufactures of carpets, soap, leather, oil, gloves, etc. Pop. 46,481.

Halcyon (hal'si-on), an old or poetical name of the kingfisher. It was fabled to lay its eggs in nests that floated on the sea, about the winter solstice, and to have the power of charming the winds and waves during the period of incubation, so that the weather was then calm; whence the term, *halcyon days*. See also *Kingfisher*.

Hale (hāl), Edward Everett, author and clergyman, born at Boston, Massachusetts, in 1822. He was graduated at Harvard in 1839, was the pastor of a Unitarian Church in Worcester, Massachusetts, 1846-56, and of one in Boston 1856-1903, when he was appointed chaplain of Congress. He died June 6, 1909. His books were numerous and a number of them highly popular. Prominent among them were *The Man Without a Country*, *Ten Times One is Ten*, *Philip Nolan's Friends*, *A New England Boyhood*, etc.

Hale, Horatio, philologist, was born in New Hampshire, about 1817, a son of S. J. Hale. Graduating at Harvard in 1837, he studied philology and produced a valuable work entitled *Ethnology and Philology*, that contained a remarkable amount of information on those subjects. He also edited the *Iroquois Book of Rites*. He died in 1896.

Hale, John P., statesman and Free-soil candidate for the Presidency, was born at Rochester, New Hampshire, in 1806. Elected to Congress in 1842, he became prominent in his opposition to slavery. In 1846 Mr. Hale was chosen U. S. Senator. In 1847 he was nominated for the Presidency by the National Liberty party, and in 1852 by the Free-soil party. His speeches were replete with humor and pathos. His 16 years in the Senate were devoted to the agitation of the slavery question. He died in 1873.

Hale, Nathan, an American patriot, was born at Coventry, Connecticut, in 1755. He was graduated at Yale College in 1773, entered Washington's army in 1775, and took part in the battle of Long Island in 1776. Being sent by Washington to penetrate the enemy's line and obtain information, he was taken, condemned as a spy, and executed the next day, September, 1776. He has since been looked upon as a martyr to the cause of liberty. He said, 'I only regret that I have but one life to lose for my country.'

Hale, Sarah Josepha, authoress, was born at Newport, New Hampshire, in 1793; died in 1879. She published *The Genius of Oblivion, and other Poems* in 1823, and *Northwood*, a novel, in 1827. She edited the *Ladies Magazine*, Boston, 1828-37, and published other poems and works of fiction.

Hales (hālz), Alexander de, surnamed the *Irrefragable Doctor;* an English theologian, born at Hales in Gloucestershire, date unknown, celebrated among the controversialists of the thirteenth century. He died at Paris in 1245.

Halévy (ä-lā-vē), Jacques François Fromental Elie, a French musical composer, born of Jewish parentage at Paris, 1799. He studied at the conservatory under Lambert and Cherubini, and was sent to Italy to finish his musical education. Here he wrote his first two operas *Les Bohémiennes* and *Pygmalion*. The first of his pieces performed was a little comic opera, *L'Artisan*, given at the Théâtre Feydau in Paris, in 1827. His chef d'œuvre, *Le Juive*, appeared in 1835, and rapidly obtained a European celebrity. Among his other works are *L'Eclaire, Guido et Ginevra, La Reine de Chypre, Le Val d'Andorre*, and *La Fée aux Roses*. He died at Nice in 1862. He was a cultivated and scholarly composer but without much genius.—His son, Ludovic Halévy, born in 1834, was a popular author of vaudevilles, and wrote the librettos of most of Offenbach's operas. He also wrote the charming *L'Abbé Constantin* and other novels, and a number of plays, including *Frou Frou* and *Tricoche et Caealot*, a comedy which had a remarkable success. He died in 1908.

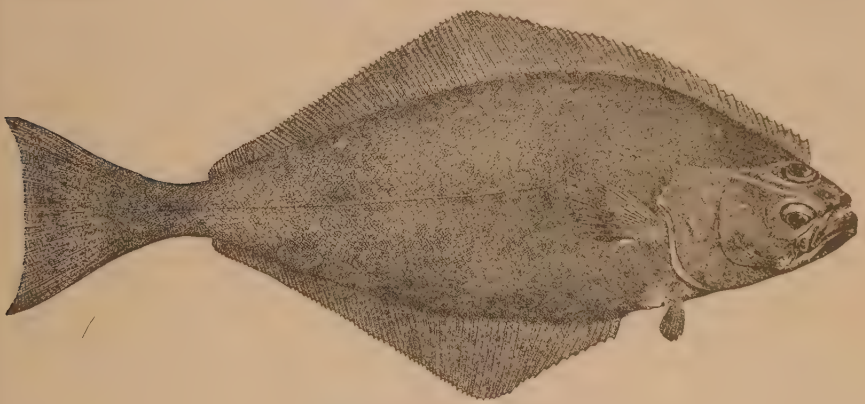
Half-moon, in fortification, an outwork composed of two faces forming a salient angle, whose gorge is in the form of a crescent or half-moon.

Half-pay, in the British army, is granted as a remuneration for past services, either to an officer who retires altogether from active duty after the full period of service, or to one who is compelled by ill-health, reduction of his regiment, or some exceptional cause, to quit active service for a time.

An officer placed on the retired list in the United States army is granted 75 per cent. of the pay of his rank.

Half-pike, a defensive weapon, formerly used in the navy to repel the assault of boarders.

Half-tone, an illustration printed from a plate produced by the half-tone process. By this process blocks that may be used in an ordinary press are made from photographs. The illustrations show not only black and white, but all the gradations between these —the 'half' and other fractional 'tones,' once thought to be beyond the power of ordinary printing.



Halibut (*Hippoglossus vulgāris*).

Haliaëtus (hal-i-ā'tus), the genus of birds to which belong the white-tailed sea eagle of Britain, and the whiteheaded or bald eagle of America.

Haliburton (hal'i-bur-tun), THOMAS CHANDLER, an Anglo-American humorous writer, born at Windsor, Nova Scotia, in 1797; died in 1865. He practiced law in Halifax, wrote a *Historical and Statistical Account of Nova Scotia*, and contributed a series of humorous letters to a Halifax newspaper under the pseudonym of 'Sam Slick.' In 1840 he became judge of the Supreme Court of Nova Scotia, but subsequently went to England. In 1859 he was elected a member of Parliament.

Halibut (hal'i-but), or HOLIBUT, the *Hippoglossus vulgāris*, one of the largest of the Pleuronectidæ or flat-fish family, sometimes weighing more than 300 lbs. The fish has a compressed body, one side resembling the back and another the belly, and both eyes on the same side of the head. It is caught on both sides of the Atlantic, and is much prized for the table.

Halicarnassus (hal-i-kar-nas'us), in ancient geography, the capital of Caria, in Asia Minor, once an important city. Queen Artemisia erected here, in honor of her husband, King Mausōlus, the celebrated tomb hence known as the *Mausoleum*. Halicarnassus was the native place of Herodotus.

Halichondria (hal-i-kon'dri-a), an order of sponges comprising the common sponges of the British coasts. They are found incrusting stones and sea-weed below the tide-mark, and have often elegant forms, but are unfit for any use. One species, *H. oculāta*, is popularly known as the 'mermaid's glove.'

Halicore (ha-lik'o-rē). See *Dugong*.

Halifax (hal'i-faks), a city of England, in the county of York (West Riding), on the Hebble, 36 miles W. S. W. of York. It is built on a rising slope, and has a very picturesque appearance. The more modern streets are spacious and well paved. Among the principal buildings are the parish church of St. John the Baptist (restored 1879), All Souls' Church, the Square Church, the town-hall, market-hall, theater, assembly rooms, infirmary, etc. There are several charitable institutions, three public parks, and two grammar-schools. Halifax commands abundant supplies of coal and water, and an extensive inland navigation connecting it with Hull and Liverpool. It is one of the centers of the woolen and worsted manufactures in Yorkshire. a great variety of goods being

produced. There are also iron, chemical, and machine-making works. Pop. (1911) 101,556.

Halifax, a city, capital of Nova Scotia, is situated on the slope of a commanding hill, on the western side of Halifax harbor. The harbor is one of the best and most spacious in America and is easy of access at all seasons of the year. Its length from north to south is about 16 miles, and it terminates in a beautiful sheet of water called Bedford Basin, within which are 10 square miles of good anchorage. The harbor is well fortified, and has an extensive government dockyard. The city, which was first settled as a colony by Governor Cornwallis in 1749, has spacious and regular streets, an elegant Province Building, large Roman and Anglican Catholic cathedrals, a military hospital, theater, university, etc. It is the principal naval station of British America, has an extensive foreign and coasting trade, and large exports. There are numerous manufactures, including iron castings, cars, machinery paint, soap, cordage, fertilizers, skates, tobacco, paper, etc.; also rolling mills. Pop. (1911) 46,619. This city was the scene of a frightful accident on December 6, 1917, when a French vessel, loaded with munitions, including a large quantity of high explosives, was run into by a vessel laden with supplies for the Belgian Relief Commission. The munition ship was set on fire and quickly exploded with terrific violence, the whole city being shaken and the section of its known as Richmond, a district of over two square miles in area, almost completely wrecked by the explosion and the widespread conflagration that followed. This, the northern part of the city, consisted largely of frame buildings, but the more substantial buildings farther away suffered considerable damage from the violent shock. The loss in human life was great, more than 1500 persons being killed, while about 4000 were injured. The property loss was estimated at $50,000,000.

Halifax, Charles Montague, Earl of, an English poet and statesman, born in 1661; died in 1715. He was educated at Westminster School and Trinity College, Cambridge. He first attracted notice by his verses, and in 1687 wrote, in conjunction with Matthew Prior, *The Town and Country Mouse.* He entered the House of Commons as member for Malden during the Convention Parliament, became a lord of the treasury in 1692, and chancellor of the exchequer in 1694. His administration was distinguished by the adoption of the funded debt system, and by the establishment of the Bank of England. In 1700 he was raised to the peerage as Baron Halifax, was twice impeached by the House of Commons, and remained out of office during the reign of Anne. Having taken an active part in securing the succession of the house of Brunswick, George I created him an earl, and bestowed on him the order of the Garter. He became first lord of the treasury in 1714. His character was a mixture of meanness and arrogance, but his taste in literature and the arts was good, and he had a great talent for finance.

Halifax, George Saville, Marquis of, son of Sir William Saville, English statesman and writer, born in 1630; died in 1695. Having exerted himself for the return of Charles II he was created Viscount Halifax in 1667, in 1669 Earl, and in 1682 Marquis of Halifax, being also keeper of the privy seal and president of the council. He supported James II, but lost his favor by opposing the repeal of the Test and Habeas Corpus acts. He was chosen speaker of the House of Lords in the Convention Parliament, and largely contributed to the elevation of William III to the throne. He wrote *Advice to a Daughter,* various political tracts, such as the *Character of a Trimmer, Maxims of State,* etc. He himself was a specimen of the trimmer, his conduct, however, being guided more by patriotic than personal reasons.

Haliotis (hal-i-ō'tis), a genus of gasteropodous molluscs, both fossil and recent, commonly called *ear-shells,* or *sea-ears,* found adhering to rocks on the shore and remarkable for the pearly iridescence of the inner surface. The name is derived from their likeness to an ear.

Hall (häl), an ancient town of Austria, in the Tyrol, 6 miles east of Innsbruck, on the Inn, which is here navigable. It has very extensive salt works, and in recent times has become a summer resort. Pop. 6191.

Hall, a town of Würtemberg. See *Schwäbisch-Hall.*

Hall (hąl), Asaph, astronomer, born at Goshen, Connecticut, in 1829; died in 1907. He graduated at the University of Michigan, and in 1863 was made professor of mathematics in the United States navy. In 1877 he made the capital discovery of two moons of Mars, named by him Deimos and Phobos.

Hall (hąl), Basil, a naval officer and traveler, son of Sir James Hall of Douglass, born at Edinburgh in 1788, entered the navy in 1802, and became post-captain in 1817. Amongst his prin-

cipal works are: *A Voyage of Discovery to the West Coast of Corea and the Great Loo Choo Island* (1817); *Extracts from a Journal* (written on the Pacific coast of America); *Travels in North America* (1829); *Fragments of Voyages and Travels; Schloss Heinfeld, or A Winter in Styria.* He died in Gosport in 1844.

Hall, CHARLES FRANCIS, an Arctic explorer, born at Rochester, New Hampshire, in 1821. He began life as a blacksmith, became a journalist in Cincinnati; in 1860 organized an Arctic expedition in search of Sir John Franklin and remained among the Eskimos two years. In 1864 he undertook a second expedition to the same regions, where he remained till 1869. In 1871, at the instigation of Hall, the United States government fitted out the *Polaris* for an expedition to the North Pole, and placed Captain Hall in command. The *Polaris* sailed from New York, June 29, 1871, and on August 30, reached lat. 82° 16′ N., and then turned back to winter in a sheltered bay, lat. 81° 38′, where Hall died on November 8th. An account of his first expedition was given by Capt. Hall in his *Arctic Researches.*

Hall, EDWARD, an English chronicler, born in London about 1495; died in 1547. He practiced law and attained the office of judge in the sheriff's court. He had a seat in the House of Commons, and was a zealous Catholic. *Hall's Chronicle*, published in 1548, is a curious picture of the manners and customs of the age.

Hall, G. STANLEY, an American educator, born at Ashfield, Massachusetts, in 1845. He was educated at Williams College and in Germany. In 1888 he was chosen president of Clark University at Worcester, Massachusetts. He is especially noted for his work on the psychology of the adolescent. His books include *Aspects of German Culture* (1881); *The Contents of a Child's Mind on Entering School* (1894), and *Adolescence* (1905).

Hall, JAMES, author, was born at Philadelphia, in 1793; died in 1868. He studied law, practiced, and became a judge. His works include *Legends of the West, Tales of the Border, The Wilderness and the War-path*, etc., and with T. L. McKinney *The History of the Indian Tribes of North America.*

Hall, JAMES, geologist, was born at Hingham, Massachusetts, in 1811; died in 1898. He was appointed on the New York geological staff in 1837, and began a survey of the west of the state. His researches won him distinction, their results being described in *The Palæontology of New York.* He was made state geologist of Iowa in 1855, of Wisconsin in 1858, and of New York in 1866.

Hall, JOSEPH, an English prelate and writer, born in 1574. He was educated at Emmanuel College, Cambridge, became successively dean of Worcester, bishop of Exeter (1627), and bishop of Norwich (1641). He agreed with the Puritans in doctrine, but disapproved of their views of church government, and took a prominent part in defending the liturgy of the church against the views published by the Nonconformists in the tract *Smectymnuus.* In 1642 he was sent to the Tower along with twelve other prelates who had protested against their expulsion from the House of Peers. In 1643, when the destruction of the Establishment was finally resolved on by the Puritans, he was specially named in the ordinance passed for sequestering what were called notorious delinquents, and heartlessly robbed of all his property by inquisitors, who turned him houseless into the streets. Ultimately he was allowed to take possession of a small estate which he possessed at Higham, in the vicinity of Norwich. Here he spent the remainder of his days unostentatiously, performing the duties of a faithful pastor, and died at the advanced age of eighty-two, in 1656. Amongst his writings are: *Virgidemiarum*, a series of poetical satires written in his earlier years; *A Century of Meditations; Contemplations;* etc.

Hall, MARSHALL, an English physician and physiologist, born in 1790; died in 1857. He studied at Edinburgh and on the European continent, commenced practice at Nottingham in 1815, and removed to London in 1826, where he obtained a large practice. Dr. Hall was distinguished by his medical writings on diagnosis, the circulation of the blood, and female diseases; but particularly by his discoveries made public in his work on the nervous system, and by his method of restoring asphyxiated persons.

Hall, NEWMAN, an English minister, was born in 1816; died in 1902. He preached in the Congregational Church of Hull, 1842-54, was an advocate of the cause of the North during the American Civil war, and came to America in 1867, where he preached before both houses of Congress. On his return to London he was instrumental in the erection there of a monument to Abraham Lincoln. His *Come to Jesus* had a large circulation, and he wrote

also, *Italy, the Land of the Forum and the Vatican*, and other works.

Hall, Robert, a celebrated preacher among the Dissenters in England, was born at Arnsby, Leicestershire, in 1764, the son of a Baptist minister. He studied at the Baptist College at Bristol, and afterwards at Aberdeen. In 1783 he became assistant pastor of Broadmead Church in Bristol, suffered for a time from mental alienation, recovered and became pastor of the Baptist Church at Cambridge, where he soon acquired a great reputation by his preaching and his writings, such as *Apology for the Freedom of the Press* (1793); *Modern Infidelity* (1800); *and Reflections on War* (1802). He again became insane and resigned his charge, but recovering, married and settled at Leicester in 1808, till in 1826 he was again called to Bristol. Nearly all his life he suffered so intensely from calculus in the kidney that for twenty years he was never able to pass an entire night in bed, and could obtain rest only by a ruinous use of laudanum. He died in 1831.

Hall, Samuel Carter, an English writer, born in 1801; died in 1889. He studied law and became a barrister; reported parliamentary debates for the *New Times;* edited in succession the *Amulet*, the *New Monthly Magazine*, and the *Art Journal* (1839-80), besides various popular annuals, and the *Book of Gems*, *Book of British Ballads*, and *Baronial Halls*.

Hall, Thomas Cuming, an American theologian, born in Armagh, Ireland, in 1858, son of Rev. John Hall (1829-98, pastor of Fifth Avenue Presbyterian Church, New York, 1867-98). He graduated at Princeton University, and studied at Berlin and Göttingen. Ordained a minister, he was pastor of Presbyterian churches in Omaha and Chicago, and in 1898 became professor of Christian Ethics at Union Theological Seminary. Author of *The Power of an Endless Life, a Biography of John Hall, History of Ethics Within Organized Christianity.*

Hall, Walter Henry, an American choral conductor and composer, born in London, England, in 1862. He was conductor of the Brooklyn Oratorio Society from 1893, and music professor at Columbia University from 1913.

Hall, William Edward, an English writer on international law, born at Leatherhead, Surrey, in 1835; died in 1894. In 1874 he published his *Rights and Duties of Neutrals;* his greatest work, a *Treatise on International Law*, was published in 1880.

Hall, William Thomas, an American chemist, born at New Bedford, Massachusetts, in 1874, graduated at the Massachusetts Institute of Technology in 1895, and studied at Göttingen. Especially noted for his translation of many German books on chemistry.

Hall, Winfield Scott, an American physician and author, born at Batavia, Illinois, in 1861, graduated from Northwestern University in 1887, and studied at Leipzig. Widely known as a lecturer on dietetics and physiology. Author of *Laboratory Guide in Physiology, Anatomy of the Central Nervous System, Text-book of Physiology, Text-book of Normal and Pathologic Physiology, Nutrition and Dietetics, Constructive Eugenics, A Physician's Counsel to Parents, Youth and Its Problems*, etc.

Hallam (hal'am), Arthur Henry, eldest son of Henry Hallam (q. v.), born in 1811; died in 1833. He was educated at Cambridge, where he became a close friend of Tennyson, to whose sister he was engaged to be married. His premature death cut short what promised to be a notable career. He was the subject of Tennyson's poem *In Memoriam*.

Hallam (hal'am), Henry, an English historian, son of the dean of Bristol, born at Windsor in 1777. He was educated at Eton and Oxford, and studied for the law, but abandoned it for literary pursuits. His contributions to the *Edinburgh Review* brought him into notice, and his *View of the State of Europe during the Middle Ages*, which appeared in 1818, at once established his reputation. His next work, the *Constitutional History of England*, published in 1827, showed like the first the solid learning, patient research, accuracy and impartiality of statement, which are the characteristics of Mr. Hallam's work. In 1837-39 appeared his last great work, the *Introduction to the Literature of Europe*. He died in 1859.

Halle (häl'lĕ), usually called Halle an der Saale (Halle on the Saale), to distinguish it from other places of the same name, an important German town in the Prussian province of Saxony, about 20 miles northwest of Leipzig, on the river Saale. The older streets are narrow and crooked, but the appearance of the town has of late been much improved. Among the principal buildings are the Church of the Virgin and that of St. Maurice, the 'Red Tower' (a clock-tower) in the market-place, the mediæval town-house, the ruined Moritzburg, originally the citadel, the university buildings, the Protestant cathedral, the theater, and

Francke's Institution, founded by Pastor Francke in 1698, comprising an orphan asylum, schools, etc. The university, with which that of Wittenberg was incorporated in 1817, is a celebrated institution founded in 1694, and attended by 1500 students. Halle has extensive trade and manufactures, chiefly chemicals, oil, malt, dyes, agricultural machines, etc., besides its celebrated salt-works. Halle is mentioned as early as 806. It was long a powerful member of the Hanseatic League. Pop. (1910) 180,843.

Halleck (hal'ek) FITZ GREENE, poet, born at Guilford, Connecticut, in 1790. He became a clerk in a New York banking-house, and for years was in the employment of John Jacob Astor. In 1819 poems by him and a friend (J. R. Drake) appeared in the *New York Evening Post* under the signature of *Croaker & Co.*, and attracted some attention. In 1820 he published *Fanny*, his longest poem, a satire on the follies and fashions of the day. In 1822 he visited Europe. Amongst his best poems are *Marco Bozzaris*, *To the Memory of Burns*, *Alnwick Castle*, and *Red Jacket*. He died in 1867.

Halleck, HENRY WAGER, an American general, born at Utica, near New York, in 1815; was educated for the army at West Point, and entered the engineers in 1839. In 1846 he published *Elements of Military Art and Science*, and he was raised to the rank of captain for his services in the Mexican war. In 1854 he left the army and settled in San Francisco as a lawyer and director of a mining company. On the outbreak of the Civil war in 1861 he was created major-general in the United States army. He commanded at the siege and capture of Corinth in 1862, and soon after was made commander-in-chief of the Union armies, directing their movements from Washington, till superseded by General Grant in 1864, when he was appointed chief of staff. Ultimately he received the command of the South Division at Louisville, where he died in 1872. Amongst his writings are two works on *International Law*.

Halleluia (hal-e-lō'ya), or HALLELUJAH, or ALLELUIA ('praise ye the Lord'), a Hebrew formula of praise often occurring in the Psalms, and which is retained in the translations of the various Christian churches, probably on account of its full and fine sound, so proper for public religious services. The *Great Halleluja* is the name given by the Jews to Psalms cxiii-cxvii, which are sung on the feasts of the Passover and Tabernacles.

Haller (hal'lĕr), ALBRECHT VON, a Swiss physician and physiologist, born in Bern in 1708; studied medicine at Tübingen, and afterwards at Leyden under the famous Boerhaave. He became a public lecturer on anatomy at Bern, and afterwards physician to the hospital and principal librarian. In 1736 he was made professor of anatomy and surgery in the University of Göttingen. In 1747 his *Primæ Lineæ Physiologoiæ* appeared, and in 1757 his *Elementa Physiologiæ Corporis Humani*. Other works appeared later, and he was ennobled by the Emperor Francis I, and became chief magistrate of Bern, to which he had retired in 1753. Haller had a considerable reputation as a poet. He also wrote three philosophical romances, *Usong*, *Alfred the Great*, and *Fabius and Cato*. He died in 1777.

Halley (hal'li), EDMUND, an English mathematician and astronomer, born in 1656. He was educated at Queen's College, Oxford, published before he was nineteen a method for finding the aphelia and eccentricity of the planets, and stayed two years in St. Helena (1676-78) cataloging the stars of the Southern Hemisphere and arranging them into constellations. In 1682 he discovered the comet which bears his name, and his prediction of its return in 1759 was the first of its kind that proved correct. He surveyed the coast of Dalmatia at the request of the German Emperor, and returning to England, was elected Savilian professor of geometry at Oxford (1703). In 1713 he was made secretary of the Royal Society, and astronomer-royal in 1719. He died in 1742.

Halley's Comet, discovered in 1682 by Edmund Halley. (See preceding article.) Halley's demonstration that this comet was the same with the comet of 1456, 1531, and 1607 first fixed the identity of comets. It performs its revolution in about 75 years. Its last appearance was in 1910, when it failed to show the brilliance displayed on earlier occasions.

Halliwell-Phillipps, JAMES ORCHARD, originally J. O. HALLIWELL, Shakesperean scholar, was born in 1820; died in 1889. In 1839 he began his editorial labors with a reprint of *Mandeville's Travels*. He was a leading and active member of the Percy and Shakespere societies; for the former he edited the *Minor Poems* of Lydgate, *Early Naval Ballads of England*, *Nursery Rhymes of England*, etc.; and for the latter, *The Coventry Mysteries*, *Tarleton's Jests*, *The Fairy Mythology of Shakespere*, etc. His

chief Shakespearean publications are a *Life of Shakespeare* (1848), the *Works of Shakespeare*, etc.

Hall-mark, the official stamp affixed by the Goldsmiths' Company of London and certain assay offices to articles of gold and silver as a mark of their fineness. The hall-mark generally denotes the place of manufacture or assay, as an anchor for Birmingham; a leopard's head for London; tree, salmon, and bell for Glasgow; a crown for Sheffield. The standard hall-mark of London is a lion passant (silver) or a crown (gold); for Edinburgh, a thistle; for Glasgow, a lion rampant.

Hall of Fame, an institution at New York University for the purpose of perpetuating the memory of great Americans. The colonnade of the Hall of Fame, overlooking the Palisades and the Hudson River, was dedicated in 1900 and in that year 100 names were voted upon for inclusion in the Hall of Fame. The list was increased to 234 names and of these 29 received a majority vote and were declared elected. In 1905 five more names were added; in 1910 eight; in 1915 eight; in 1920 six; making in all up to 1921 a total of 56 names of Great Americans inscribed in the Hall of Fame. In 1904 New York University set apart a site for a Hall of Fame for Women. Following are the names of those in the Hall of Fame:

Authors: Ralph Waldo Emerson, Nathaniel Hawthorne, Washington Irving, Henry Wadsworth Longfellow, James Russell Lowell, John Greenleaf Whittier, George Bancroft, William Cullen Bryant, James Fenimore Cooper, Oliver Wendell Holmes, John Lothrop Motley, Edgar Allan Poe, Francis Parkman, Samuel Langhorne Clemens. *Educators:* Horace Mann, Mark Hopkins. *Preachers, Theologians:* Jonathan Edwards, Henry Ward Beecher, William Ellery Channing, Phillips Brooks, Roger Williams. *Philanthropists, Reformers:* Peter Cooper, George Peabody. *Scientists:* John James Audubon, Asa Gray, Louis Agassiz, Joseph Henry. *Engineers, Architects:* James Buchanan Eads. *Physicians, Surgeons:* William Thomas Green Morton. *Inventors:* Robert Fulton, Samuel Finley Breese Morse, Eli Whitney, Elias Howe. *Missionaries, Explorers:* Daniel Boone. *Soldiers, Sailors:* David Glascoe Farragut, Ulysses Simpson Grant, Robert Edward Lee, William Tecumseh Sherman. *Lawyers, Judges:* James Kent, John Marshall, Joseph Story, Rufus Choate. *Rulers, Statesmen:* John Adams, Henry Clay, Benjamin Franklin, Thomas Jefferson, Abraham Lincoln, George Washington, Daniel Webster, John Quincy Adams, James Madison, Andrew Jackson, Alexander Hamilton, Patrick Henry. *Musicians, Painters, Sculptors, Etc.:* Gilbert Charles Stuart, Augustus Saint-Gaudens.

Following are the names in the Hall of Fame for Women: *Authors:* Harriet Beecher Stowe. *Educators, Missionaries:* Mary Lyon, Emma Willard, Alice Freeman Palmer. *Philanthropists, Reformers, Home or Social Workers:* Frances Elizabeth Willard. *Scientists:* Maria Mitchell. *Musicians, Painters, Sculptors, etc.:* Charlotte Saunders Cushman.

Hallowe'en (hal'ō-ēn), or HALLOWEVEN, the evening of the 31st of October, so called as being the eve or vigil of All Hallows, or All Saints, which falls on the 1st of November. The celebration of it in various ways has spread widely.

Hallucinations (hal-u'si-nā'shuns), apparent perceptions without corresponding external objects. Hallucinations are to be distinguished from illusions, for in these there are real sensory objects, though they are erroneously interpreted. Hallucinations of several senses may exist simultaneously in the same individual, but the most common are those of hearing and sight, though those of taste, smell and touch also occur. The simplest form of hallucinations of hearing is the tingling of the ears; but the striking of clocks, the sounds of musical instruments and of the human voice are often heard, and in these instances, as in those of the perturbations of the other senses, there must be a diseased sensorium, though there be no structural derangement of the nerves.

Halluin (äl-ū-aṇ), a town of France, dep. of Nord, on the right bank of the Lys, 10 miles N. N. E. of Lille. It has considerable manufactures of cloths, linen, and calicoes, besides cotton and oil mills, etc. Pop. 16,000.

Hallux (hal'lukz), the innermost of the five digits which normally compose the hind foot of a vertebrate animal; in a person the great toe, in a bird the hind toe.

Halmstadt (hälm'stät), a seaport of Sweden, on the Cattegat, at the mouth of the Nissa. It has cloth-making, brewing, salmon fisheries, and a trade in deals, lumber, pitch. Pop. 18,276.

Halo (hā'lo), the name given to colored circles of light sometimes seen around the sun or moon, and to other connected luminous appearances.

They are the result of certain modifications which light undergoes by reflection, refraction, dispersion, diffraction, and interference when it falls upon the crystals of ice, the raindrops, or the minute particles that constitute clouds. See also *Corona.*

Halpine (hal'pēn), CHARLES GRAHAM, poet and humorist, born in Ireland in 1829, came to the United States and adopted the profession of journalism. He served in the Civil war, and was brevetted brigadier-general at its close. Under the pen-name of Miles O'Reilly he wrote *Poems, Miles O'Reilly Papers,* etc. He died in 1868.

Hals (häls), FRANS, a portrait and genre painter, born probably at Antwerp, Belgium, about 1580; died in 1666. Hals is usually regarded as the founder of the Dutch school of genre-painting. His subjects of feasting and carousal are treated with marvelous vivacity and spirit, and as a portrayer of faces convulsed with laughter he is without a rival. Of his portrait groups eight noble examples are preserved in the museum of Haarlem, the finest being that dated 1633, representing the officers of the corps of St. Adrian. *The Mandoline Player* (1630), in the gallery of Amsterdam, *The Laughing Cavalier,* and *Hille Bobbe* (National Gallery, Berlin), are typical examples of his single figures.

Halstead (hal'sted), MURAT, journalist, was born in Butler County, Ohio, in 1829; died in 1908. As proprietor of the Cincinnati *Commercial,* and later of the *Commercial Gazette,* he became an important figure in the annals of the Republican party.

Ham, one of the three sons of Noah. He had four sons—Cush, Mizraim, Phut, and Canaan—from the first three of whom the tribes that peopled the African continent are stated to have sprung, while Canaan became the father of the tribes that principally occupied the territory of Phœnicia and Palestine.

Ham, the inner angle of the joint which unites the thigh and the leg of an animal, but more generally understood to mean the cured and smoked thigh of the hog.

Hamadan (häm-â-dän'), a city of Persia, on the site of the ancient Ecbatana, in the province of Irak-Ajemi, 185 miles southwest of Teheran. It is pleasantly situated near the base of a great range of mountains, and is surrounded by ruins as well as by beautiful orchards and gardens. It has extensive caravanseries and bazaars, a number of tanneries, and also considerable manufactures of carpets, woolens, and cotton stuffs. Pop. estimated at 40,000.

Hamadryad (ham'a-drī'ad), in Greek mythology, a wood-nymph believed to inhabit a particular tree with which they were born and with which they perished. (See *Nymphs.*) In herpetology, a large Oriental cobra-like snake (*Ophiophagus elaps*). It occurs from Ceylon to the Philippines and is the largest of all venomous snakes, attaining a length of 12 feet and possessing an aggressive temper; it is known as the King Cobra (*Naja regina*). In mammalia, a large Abyssinian baboon. (See *Baboon.*)

Hamah (hä'ma), or HAMATH, a city of Syria, on the banks of the Orontes or El-Azy, on the caravan route between Aleppo and Damascus, in a well-watered and productive district. Amongst the curiosities are huge Persian water-wheels, 70 or 80 feet in diameter, which are turned by the current of the river and supply the houses and gardens with water. The famous *Hamath Inscriptions* were noticed by Burckhardt in 1812, but have not yet been deciphered.

Hamamelidaceæ (ham-a-mel-i-dā'-se-ē), the witch-hazels, a small natural order of epigynous exogenous trees or shrubs, varying in height from 6 to 30 feet. *Hamamelis Virginica* yields the drug witch hazel.

Hamburg (ham'burg), a maritime city in the Free State of Hamburg, Germany, the greatest port on the continent, and second largest city of Germany, is situated about 80 miles from the North Sea, on the north branch of the Elbe, which is navigable for large vessels. The town of Altona adjoins it on the west. From the Elbe proceed canals which intersect the eastern and lower part of the city in all directions, and it is also intersected by the Alster, which here forms two fine streets, the Binnenalster and Aussenalster. The quays and harbor accommodations are very extensive. After the destructive fire of 1842 whole streets were rebuilt in a magnificent and expensive style. Hamburg is not, however, very rich in notable buildings. Amongst the most important are the church of St. Nicholas, a noble Gothic structure with a lofty tower and spire, built between 1845 and 1874; St. Peter's, another lofty Gothic edifice; St. Michael's, the largest of the churches; St. Catherine's, an ancient edifice; St. James's, erected in 1354, but surmounted by a modern tower;

an elegant Jewish temple; an exchange, a noble edifice, consisting chiefly of a magnificent hall, surrounded by a fine colonnade. There are also the Johanneum institution, containing an ancient college, museums, and the city library, with about 300,000 volumes; several well-endowed hospitals; zoological and botanic gardens; the Kunsthalle, a large collection of pictures and sculpture; theaters, etc. Hamburg is of most importance on account of its great shipping trade and the business of banking, exchange, marine assurance, etc., carried on in connection with that. Its manufactures, though large, are less important, including shipbuilding, tobacco and cigar making, iron-founding, brewing, etc. A great many emigrants embark here. Pop. 953,079. The state of Hamburg embraces a territory of 158 square miles, and consists of three divisions, viz.:—City of Hamburg, fifteen rural districts, and outlying towns and bailiwicks (Cuxhaven, Ritzebüttel, etc.). The legislative power belongs in common to the senate and the house of burgesses, but the executive power is vested chiefly in the senate, which is composed of eighteen members, of whom nine must have studied law or finance, and of the other nine seven must belong to the commercial class. The members are elected for life. The house of burgesses consists of 160 members, half of whom are elected every three years by the votes of all tax-paying citizens, while the other half are chosen partly by a much-restricted franchise, and partly deputed by guilds and corporations. The city owes its foundation to the emperor Charlemagne, who (808-811) built a citadel and a church on the heights between the Elbe and the eastern bank of the Alster, as a bulwark against the neighboring pagans. It became important as a commercial city in the twelfth century, and in the thirteenth it combined with Lübeck in forming the Hanseatic League. In 1618 Hamburg was formally acknowledged a free city of the empire. During the Thirty Years' war its population and prosperity continued to increase on account of the immunity of its position, and in the following century it obtained a large share of the trade with North America. In 1810 it was formally incorporated in the French empire with the northwestern part of Germany; in 1815 it joined the Germanic Confederation as a free city; in 1888 it was included in the Zollverein.

Hamden, a town (township) of New Haven County, Conecticut, 6 miles N. of New Haven. Iron castings, suspender webbing, radiators, corsets and garden implements are produced. Pop. (1920) 8611.

Hameln (hä'meln), a town of Germany, in Hanover, on the Weser, which is here crossed by a suspension bridge. It has many picturesque old buildings and remains. Pop. 18,965.

Hamerton (ha'mer-tun), PHILIP GILBERT, an English art critic, born at Laneside, in Lancashire, in 1834; studied landscape painting, but deviated into literature, publishing a work on *Heraldry* in 1851, and in 1855 *The Isles of Loch Awe and other Poems.* In 1859 Mr. Hamerton married a French lady, and afterwards resided chiefly at Autun. He made himself well known to the English public as a writer on art. Amongst his works are *Thoughts about Art* (1862), *Contemporary French Painters* (1867), *The Intellectual Life* (1873), *French and English* (1889), and several novels. He died in 1894.

Hamilcar (ham-il'kär), the name of several Carthaginian generals, of whom the most celebrated was Hamilcar, surnamed Barca (the lightning), the father of the great Hannibal. While quite a young man he was appointed to the command of the Carthaginian forces in Sicily, in the eighteenth year of the first Punic war, B.C. 247, when the Romans were masters of almost the whole island. For two years he defied all the efforts of the Romans to dislodge him; but the Carthaginian admiral, Hanno, having been totally defeated off the Ægates, B.C. 241, he reluctantly consented to evacuate Sicily. A revolt of the returned troops, joined by the native Africans, was successfully repressed by Hamilcar. He then entered on a series of campaigns in Spain, where he founded a new empire for Carthage. Here he passed nine years, and had brought the whole southern and eastern part of the country under Carthaginian rule when he was slain in battle against the Vettones, B.C. 229. His great design of making Spain a point of attack against Rome was ably carried out by his son Hannibal.

Hamilton (ham'il-tun), a city of Scotland, in Lanarkshire, on the Clyde, about 10 miles southeast of Glasgow. Numerous villas and gardens give it a pleasant rural aspect. Coal, ironstone, and limestone are extensively worked in the vicinity. The county buildings, town-hall, and extensive cavalry barracks are the most important public buildings. Near the town is Hamilton Palace, seat of the Duke of Hamilton, a large building, chiefly modern. In the

adjacent grounds are the ruins of Cadzow Castle and a few old oaks, the remains of Cadzow Forest. Here a herd of wild cattle are kept, white, with black ears and muzzles. Pop. (1911) 38,644.

Hamilton, the island metropolis of the western district of Victoria, Australia, on the Grange Burn Creek, counties of Dundas and Normandy, 224 miles W. of Melbourne, with which it is connected by railway. The district is pastoral and agricultural. Pop. 5000.

Hamilton, the capital of the Bermudas, on the coast of the largest island, with a landlocked harbor. Pop. 2627.

Hamilton, a city of Canada, in the province of Ontario, county of Wentworth, on the south side of Burlington Bay, Lake Ontario, an important railway center, with excellent water shipping facilities, is situated in a fertile horticultural and agricultural section. The public buildings include custom house, theaters, public schools, Collegiate Institute, Technical School, Normal School and the Provincial Asylum for the Insane. Dundurn Park (40 acres) is notable. There are numerous factories engaged in the manufacture of steel, iron, cotton and woolen goods, agricultural machinery, plows, boats, furniture, wire fencing, machinery, etc. Pop. 100,808.

Hamilton, a city, county seat of Butler County, Ohio, on the Great Miami River, 25 miles north of Cincinnati. A manufacturing city with large safe and bank vault factories, paper mill, tool and Corliss engine plants, etc. Served by four steam and two electric railways. Founded in 1791 by General Arthur St. Clair. The site of old Fort Hamilton is marked by a monument. Pop. (1910) 35,279; (1920) 39,675.

Hamilton, Alexander, a distinguished American officer and legislator during the contest for independence, was born in 1757 in the island of Nevis, West Indies. At the age of sixteen he became a student of Columbia College, New York. On the outbreak of the war he received (1776) a commission as captain of artillery, and soon attracted the attention of Washington, who appointed him his aide-de-camp and employed him in the most delicate and difficult affairs. In 1781 he left the service, studied, entered Congress as a member from New York in 1782, and in 1787 was one of the delegates to the Constitutional Convention. He was a strong supporter of the federal party, and by the letters which he wrote to the *Daily Advertiser*, of New York, afterwards published under the title of *The Federalist*, contributed greatly to the success of the party. It was due to his strenuous efforts that the constitution was ratified by the State of New York. On the organization of the federal government in 1789, with Washington at its head, Hamilton was appointed secretary of the treasury, and won a high reputation by his skilful treatment of the national finances. This office he held till 1795, when he resigned and retired into private life. In 1798 he was appointed second in command of the provisional army raised under the apprehension of a French invasion, and on the death of Washington, in 1799, he became commander-in-chief. In 1804 he became involved in a political dispute with Aaron Burr, then candidate for the governorship of New York, accepted a challenge from that gentleman, and received a fatal wound in the subsequent duel, July 11, 1804.

Hamilton Andrew (1676-1741), an American lawyer, perhaps the ablest of his time and the first to achieve a continental reputation. In 1717 he became attorney-general of Pennsylvania and was in the provincial council 1721-24. He was elected from Bucks county to the provincial assembly 1727-39. He is best known for his gratuitous defense of John Peter Zenger (q. v.), of New York, who was arrested for printing seditious libels. Hamilton's defense resulted in the acquittal of Zenger and established freedom of the press in North America. He was born in Scotland, went to Virginia, and removed to Philadelphia.

Hamilton, Andrew (?-1703), an English colonial governor in America, born in Scotland. From 1692 to 1701 he was governor of the colonies of East and West Jersey, and was appointed deputy governor of Pennsylvania by William Penn in 1701.

Hamilton, Sir Ian Standish Monteith (1853-), a British general, born at Corfu. He entered the army in 1873, served in the Afghan war (1878-80), Boer war (1881), Nile Expedition (1884-85), and in the South African war of 1899-1901, where he took part in the defense of Ladysmith. He was chief of staff to Lord Kitchener (q. v.), 1901-02. He fought in the European war (1914-18) and commanded the Mediterranean Expeditionary Forces in the heroic campaign at Gallipoli (q. v.).

Hamilton, James, a marine painter, was born in Ireland about 1820, and was brought to the United States in infancy. He studied and practiced art in Philadelphia, and won distinction by his illustrations of Dr. Kane's *Arctic Explorations* and his ad-

mired *Capture of the Serapis* and *Old Ironsides*. He was especially successful in the representation of water scenes, and was unsurpassed in his delineation of oceanic effects. He died in 1878.

Hamilton, PATRICK, usually considered as the first Scottish reformer, was the second son of Sir Patrick Hamilton of Kincavel and Stanehouse, and of Catharine, daughter of the Duke of Albany, second son of James II. He was probably born in Glasgow in 1504, and was educated partly at St. Andrews and partly at Paris, where he took his degree in 1520. While still a boy he had been appointed Abbot of Fearn, in Rosshire, but never went into residence, settling instead at St. Andrews in 1523. Here he began to announce his convictions in the principles of the Reformation, and was summoned in 1526 by Archbishop Beaton to stand his trial for heresy. He fled to Germany, where his education as a reformer was completed by an intimate acquaintance with Luther and Melanchthon. After six months' absence he returned to Scotland, and began to preach the gospel openly at Linlithgow, but was allured by Beaton to St. Andrews under pretence of a friendly conference, put on his trial, convicted of various heresies, and burned at the stake, March 1, 1527, in the twenty-third year of his age. His death did perhaps more to extend the principles of the Reformation in Scotland than even his life could have done.

Hamilton, SIR WILLIAM, grandson of William, third duke of Hamilton, was born in Scotland in 1730. In 1761 he was elected member of parliament for Midhurst, and in 1764 he received the appointment of ambassador to the court of Naples. He devoted his leisure to science, making observations on Vesuvius, Ætna, and other volcanic mountains; and the results of his researches are detailed in the *Philosophical Transactions*, and in his *Campi Phlegræi, or Observations on the Volcanoes of the Two Sicilies* (Naples, 1776-79, three vols. folio). He took an active part in the excavation of Herculaneum and Pompeii, and collected a cabinet of antiquities, of which an account was published by D'Hancarville, in a splendid work with finely colored plates. Sir William's second wife was the Lady Hamilton, who became notorious from her connection with Admiral Nelson. He died in 1803.

Hamilton, SIR WILLIAM, a metaphysician, the most acute logician and most learned philosopher of the Scottish school, was born in 1788 at Glasgow, where his father and grandfather held in succession the chairs of anatomy and botany. Having studied with distinction at Glasgow, in 1809 he entered Baliol College, Oxford, as a Snell exhibitioner, where he gained first-class honors. In 1813 he was admitted to the Scottish bar, but never acquired a practice in his profession, his taste lying much more towards the study of philosophy, in which he had already made extensive researches. In 1820 he became a candidate for the chair of moral philosophy in Edinburgh, rendered vacant by the death of Thomas Brown, but being defeated by Professor John Wilson, he was obliged to content himself with the unimportant chair of universal history, forming no part of the college curriculum, to which he was appointed in 1821 by its patrons, the Faculty of Advocates. In 1829 the publication in the *Edinburgh Review* of his celebrated critique of Cousin's system of philosophy gave him at once a first place amongst the philosophical writers of the time. This was followed in 1830 by his criticism of Brown, and in 1831 by his article on the authorship of the *Epistolæ Obscurorum Virorum*. In 1836 he was appointed to the chair of logic and metaphysics in Edinburgh University. Here he gathered about him a number of ardent students, and re-established the fame of the Scottish school of metaphysicians, which had begun to wane. In 1846 he published an annotated edition of the works of Thomas Reid, and in 1854 the first volume of a similar edition of the works of Dugald Stewart. He died suddenly at Edinburgh in 1856. His lectures on logic and metaphysics were collected and edited by Dean Mansel and Professor Veitch. Hamilton's most important contributions to philosophy are connected with his doctrine of the Quantification of the Predicate in his system of logic; his theory of the 'relativity of knowledge,' in the Kantian sense, held along with an apparently incompatible doctrine of immediate perception of the non-ego; and his definition of the infinite or unconditioned as a mere negation of thought.

Hamilton, SIR WILLIAM ROWAN, mathematician and astronomer, was born in Dublin in 1805. Before he had completed his fourteenth year he had made himself acquainted with thirteen languages, among which were Arabic, Persian, Hindustani, Sanskrit, and Syriac. At the age of seventeen he was pronounced by a competent authority the first mathematician of his age. At Trinity College, Dublin, he gained the highest honors, and he was appointed in 1827 professor of astronomy in Trinity College,

HAMMERFEST, THE TOWN FARTHEST NORTH

as well as astronomer-royal. He was knighted in 1835, and elected in 1837 president of the Royal Irish Academy. His fame is chiefly founded on his discovery of quaternions (q. v.).

Hamilton College at Clinton, N. Y., founded in 1793 by Rev. Samuel Kirkland, a Congregational missionary; formally opened in 1799 and named for Alexander Hamilton. It is distinctly a classical college; especially noted for its rhetorical and oratorical departments. Students, 300.

Hamilton Group, an American geological formation, occupying the middle of the Devonian period, so named from Hamilton, New York, near which it is best displayed. It consists of shales, with some limestones, and follows the Appalachian system southward into Virginia, with an extension westward into and beyond Ohio. Flagstones of excellent quality are obtained from it, and some of its deeper bituminous) layers are supposed to be the chief source of the Pennsylvania and West Virginia petroleum and natural gas. The fossils include land and water plants, invertebrate animals and fishes.

Hamirpur (hum-ēr-pur′), a town of India, Northwestern Provinces, on the right bank of the Jumna. Pop. 7155.

Hamites (ham′īts; descendants of Ham), the name given to a number of races in North Africa, who are regarded as of kindred origin and speak allied tongues. They include the ancient Egyptians and their modern descendants, the Copts, the Berbers, Tuaregs, Kabyles, the Gallas, Falashas, Somali, Dankali, etc.

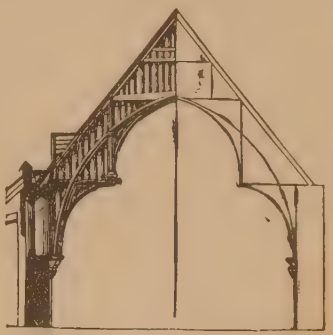
Hamlet (ham′let), Prince of Denmark, the hero of Shakespere's most famous tragedy. The story is founded on an old tradition, related, amongst others, by Saxo-Grammaticus, of a Danish prince, Hamlet, who lived about 500 B.C., but is essentially altered in details and conclusion.

Hamlin (ham′lin), Hannibal, Vice-President, was born at Paris, Maine, in 1809. He practiced law, and served as a member of the Legislature. In 1842 he was elected to Congress, and in 1848 to the Senate. In 1860 he was elected vice-president with Lincoln. He was returned to the Senate in 1869, serving until 1881, and died in 1891.

Hamm (häm), a manufacturing town of Prussia, province of Westphalia. Its industries, which are important, are mainly in metals. Pop. 43,658.

Hamme (häm), a town in the province of E. Flanders, Belgium, 18 m. N. E. of Ghent. Among its principal manufactures are rope, oil, lace, and linen. Pop. 15,000.

Hammer-beam, a short beam attached to the foot of a principal rafter in a roof, in the place of the tie-beam. Hammer-beams are used in pairs, and project from the wall, extending less than half-way across the apartments. The hammer-beam is generally supported by a rib rising up from a corbel below; and in its turn forms the support of another rib, constituting, with that springing from the opposite hammer-beam, an arch.



Hammer-beam Roof, Westminster Hall.

Hammer-cloth, a cloth sometimes used to cover the box-seat of a private carriage. It usually bears the coat of arms of the owner of the carriage.

Hammerfest (häm′ėr-fest), a maritime town in Norway, in Finmarken, on Hvalöe (Whale Island), a bare, treeless, barren spot, in lat. 70° 40′ N., being th s the most northerly town in the world. It is a fishing center, and carries on a lively trade. Though within the Arctic circle, the winter is comparatively mild, and the surrounding waters seldom freeze. Pop. 2298.

Hammer-headed Shark. See *Shark.*

Hammer-oyster, a bivalve shellfish, *Malleus vulgāris*, inhabiting the Indian Archipelago, resembling the pearl-oyster when young, but becoming always more hammer-like as it advances in age, by the lengthening of its two ears.

Hammer-Purgstall (pur̆g-stål′), Joseph Freiherr von, an eminent orientalist, was born in 1774 at Gratz, in Styria. He was educated at the Oriental Academy, Vienna, and when still a very young man

took a share in the preparation of Meninsky's *Arabic, Persian, and Turkish Lexicon.* In 1799 he accompanied as interpreter to Constantinople the internuncio Freiherr von Herbert, who afterwards intrusted him with a mission to Egypt, where he collected various antiquities and manuscripts for the Imperial Library. He also accompanied, as interpreter and secretary, Sir Sidney Smith and Yussuf Pasha in the campaign against General Menou. In 1810, on the occasion of the marriage of Napoleon with Maria Louisa of Austria, he accompanied the latter to Paris, where he became intimate with Sylvestre de Sacy and other orientalists. In 1817 he was appointed imperial councillor at the court of Austria, where he also held the post of interpreter. On succeeding to the estates of the Countess of Purgstall in 1835 he received the title of *Freiherr* (Baron). He died in 1856. Among his numerous literary works may be mentioned *Constitution and Administration of the Ottoman Empire; Constantinople and the Bosporus; History of the Ottoman Empire* (ten vols.); *History of Turkish Poetry;* and *History of Arabic Literature.*

Hammersmith, a suburban district of London, in Middlesex, about 6 miles W. S. W. of the London post-office. The Thames is here crossed by a fine suspension bridge. The vicinity is occupied chiefly by nurseries and market-gardens. Pop. of parish, 121,603.

Hammerstein (ham'ėr-stīn), Oscar, theatrical and operatic manager, born at Berlin, Germany, in 1847; came to America in 1863. He engaged in the cigar business, invented labor-saving devices in this industry, grew wealthy, and engaged in theatrical and operatic enterprises. He wrote several short comedies in German and produced them in New York. Became manager of the Stadt Theater in 1870, and subsequently built the Harlem Opera House, the Manhattan Opera House, and several theaters. He built in 1907 a magnificent opera house in Philadelphia, which he sold in 1910 and went to England, where he built a grand-opera house in London. His rivalry with the Metropolitan Opera Co. ended in his signing an agreement (1910) not to produce opera for ten years. He died August 1, 1919.

Hammock (ham'ok), a rectangular piece of cloth or netting about 6 feet long and 4 feet wide, gathered together at the two ends and slung horizontally, forming a sort of bed or place in which one may recline for pleasure. Hammocks are in common use on board ships of war. The word is said to be of Caribbean origin.

Hammond (ham'und), a city of Lake Co., Indiana, on Grand Calumet River, 20 miles S. E. of Chicago. It has manufactures of chemicals, pianos, mattresses, machinery, etc. Pop. (1910) 20,925; (1920) 36,004.

Hammond, John Hays, mining engineer, was born at San Francisco in 1855. He studied mining at Freiburg, Saxony, and became an expert on the United States geological survey in 1880. He subsequently examined mining fields in all parts of the world, being consulting engineer in South Africa 1893-96. Then he joined in the reform movement, and though taking no part in the Jameson raid; yet was arrested in connection with it and sentenced to death, a sentence, afterwards commuted to fifteen years' imprisonment. He was later released on payment of a fine of $125,000. In 1911 he was appointed to represent the United States at the coronation of George V.

Hammond, William A., surgeon, born at Annapolis, Maryland, in 1828; died in 1900. He graduated at the University of New York in 1848, and entered the army as assistant surgeon. He became professor of anatomy and physiology in the University of Maryland in 1860, re-entered the army in 1861, and was appointed surgeon-general in 1862. He was professor of nervous diseases at Bellevue Hospital (1868-73) and subsequently at the University of New York. He wrote *Sleep and its Derangements,* and other works.

Hammonton (ham'on-ton), a town of Atlantic Co., New Jersey, 31 miles S. E. of Philadelphia, in a fruit and poultry district, with shoe, glass and clothing factories. Pop. 6417.

Hammurabi (hä-mö-rä-bē), a king of Babylon, identified by Schräder with Amraphel, king of Shinar (Gen. 14:1). By his victories over Elam, Larsa, Sumer and Akkad he unified the Babylonian empire. His reign is variously dated between 2400 and 2000 B. C. The discovery and translation of the Hammurabi code in 1902 threw much light on Babylonian history.

Hampden (hamp'den), John, celebrated for his patriotic opposition to taxation by prerogative, was born in London in 1594, being cousin-german by the mother's side to Oliver Cromwell. In 1609 he was entered a gentleman commoner at Magdalen College, Oxford. He began the study of law in the Inner Temple, but having inherited an ample fortune on his father's death he lived the usual life of a country gentle-

man. He entered Parliament in the beginning of Charles I's reign as member for Grampound, and continued to sit in the House of Commons three times in succession as member for Wendover, and finally as member for Bucks. Although for some years a uniform opposer of the arbitrary practices in church and state, it was not until 1636 that his resistance to Charles's demand for ship-money made him the argument of all tongues. Although the decision in the Court of Exchequer was given against him by seven voices to five, the victory, as far as regarded public opinion, was his. In the following year (1637) he was one of those who meditated emigration to America, which they were prevented from carrying out by an order in council detaining them. Henceforward he took a prominent part in the great contest between the crown and the Parliament, and was one of the five members whom the king, in 1642, so imprudently attempted, in person, to seize in the House of Commons. When the appeal was made to the sword, Hampden accepted the command of a regiment in the Parliamentary army under the Earl of Essex, and was fatally wounded on Chalgrove Field, 24th June, 1643.

Hampshire (hamp'shir), HANTS, or SOUTHAMPTONSHIRE, a maritime county, including the Isle of Wight, in the south of England; area 1640 sq. miles. Its surface is pleasantly varied with gently rising hills, fruitful valleys, and extensive woodlands. The coast-line is very irregular; the principal indentation, Southampton Water, is navigable almost to its head for vessels of considerable burden. In its confines is the New Forest, and among its streams is the Avon. Two ranges of chalk hills, the North and South Downs, traverse the county, running in direction nearly east and west. On the Downs large flocks of sheep, known as the 'Hampshire Downs' are fed. Hampshire is also famous for its wool, bacon, honey, and timber. The manufactures are unimportant, but the shipping is very extensive. Pop. 915,503.

Hampstead (hamp'sted), a suburb of London, and Parliamentary borough in Middlesex. It is situated on the declivity of a hill on the northwestern side of the city, and has long been celebrated for its fine air and the beauty of its surroundings. Hampstead Heath crowns the summit of the hill, and is now sprinkled over with handsome villas. Pop. 82,329.

Hampton (hamp'tun), a village of Middlesex, situated 14 miles S. W. of London, on the left bank of the Thames. Pop. 9221. About a mile from the village are the palace and park of Hampton Court, originally built by Cardinal Wolsey in 1525. Hampton Court has been the residence of many sovereigns, from Henry VIII, to whom it was presented by Wolsey, down to George II. It contains a valuable collection of pictures by Holbein, Lely, Kneller, West, etc.

Hampton, a city, county seat of Elizabeth City County, Va., one of the original shires of the Colony of Virginia, on the north side of Hampton Roads, 15 miles N. N. W. of Norfolk; was settled in 1610; incorporated as a town in 1887, and as a city in 1908. There are large fish and oyster industries and several crab-canning factories. The Hampton Normal and Agricultural Institute (q. v.), Old Point Comfort College, and a national soldiers' home and national cemetery are here. Pop. (1920) 6138.

Hampton, WADE, grandson of a Revolutionary general of the same name, was born at Columbia, South Carolina, in 1818; died in 1902. Graduating at the University of South Carolina, he became a lawyer, and on the outbreak of the Civil war joined the Confederate army. In 1862 he served as a brigadier-general at Antietam and in 1863 was wounded at Gettysburg. Promoted major-general, he was placed in command of all the cavalry of Lee's army in 1864, and served in South Carolina in 1865. He was elected governor of South Carolina in 1876 and again in 1878, was United States Senator, 1879-91, and was appointed commissioner of railroads in 1893.

Hampton Court Conference, a conference which took place in 1604 at Hampton Court under the presidency of James I between the representatives of the Episcopalian and Puritan parties in the church. A few slight alterations were made in the Common Prayer Book, and it was determined that a new version of the Bible should be undertaken. This, the Authorized Version, appeared in 1611.

Hampton Normal and Agricultural Institute, a college for colored and Indian youths of both sexes, founded in 1868, under the auspices of the American Missionary Association and under the charge of General Samuel C. Armstrong, at Hampton, Virginia. At first devoted to colored students, Indians were admitted in 1878, 15 held as prisoners of war being the first students. The Indian pupils are chiefly from the Sioux tribe. Instruction is given in farm work and in various trades to boys, and in household work, sewing, etc., to girls. The institute has a

tract of 185 acres of farm land, and a few miles away has 600 acres mainly devoted to stockraising. The students are kept under military discipline. They number about 1300 colored and 60 Indians, under 100 instructors. Among the numerous graduates the most notable has been Booker T. Washington, of Tuskegee Institute.

Hamster (ham'stẽr; *Cricetus*), a genus of rodent animals belonging to the family of the Muridæ (mice). They are distinguished by their having cheek-pouches in which they convey grain, peas, etc., to their winter residence, and are common in the north of Europe and Asia.

Hamtramck (ham-tram'ik), a village of Wayne Co., Michigan, 5 miles N. E. of Detroit. It has numerous manufactures. Pop. (1910) 3559; (1920) 48,615.

Han, a Chinese dynasty (B. C. 206 to A. D. 220), with which commences the modern history of China.

Hanau (han'ou), a town of Prussia, province Hesse-Nassau, at the confluence of the Kinzig with the Main. Pop. (1910) 37,472.

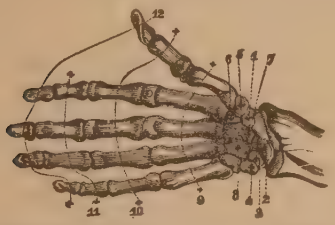
Hancock (han'kok), JOHN, a Revolutionary patriot and president of Congress, born in Quincy, Massachusetts, in 1737. In the inception of the Revolutionary struggle he was a leading spirit, and the attempt to arrest Hancock and Samuel Adams led to the battle of Lexington. Mr. Hancock was a member of the Continental Congress from 1775 to 1780, also from 1785 to 1786, serving as president of the body from 1775 to 1777. The Declaration of Independence as first published bore only his name. He served as governor of Massachusetts twelve years. As an orator he was eloquent; as a presiding officer, dignified and impartial. He died in 1793.

Hancock, WINFIELD SCOTT, soldier was born in Montogomery County, Pennsylvania, in 1824; graduated at West Point in 1844, served as lieutenant in the Mexican war, and was made captain in 1855. In 1861 he was appointed brigadier-general of volunteers, and served with distinction in the early years of the war, on the Peninsula, at Antietam, and at Fredericksburg. He commanded a corps at Gettysburg and was wounded. In 1864 he took command of the second corps of Grant's army, and at the battle of Spotsylvania captured nearly 4000 prisoners and twenty pieces of artillery. In 1864 he was made brigadier-general in the regular army and major-general in 1866, and held several commands until 1880, when he was nominated by the Democratic party as its candidate for the Presidency. He was defeated by Garfield, the Republican candidate, and died in 1886.

Hancock, a town of Houghton County, Michigan, connected with Lake Superior by a ship canal, and on the Copper Range and the Mineral Range railroads. Rich veins of pure copper are mined here, and there are extensive stamping mills, large foundries and machine shops, smelting works, etc. Pop. (1920) 7527.

Hand, the part of the body which terminates the arm, consisting of the palm and fingers, connected with the arm at the wrist; the principal organ of touch and prehension. The human hand is composed of twenty-seven bones, namely, eight bones of the carpus or wrist arranged in two rows of four each, the row next the forearm containing the scaphoid, the semilunar, the cuneiform, and the pisiform, and that next the metacarpus, the trapezium, the trapezoid, the os magnum, and the unciform. The metacarpus consists of the five bones which form the palm, the first being that of the thumb, the others that of the fingers in succession. Lastly, the fingers proper contain fourteen bones called phalanges, of which the thumb has but two, all the other digits having three each. These bones are jointed so as to admit of a variety of movements, the more peculiar being those by which the hand is flexed backwards, forwards, and sideways, and by which the thumb and fingers are moved in different ways. The chief muscles which determine these movements are the *flexors*, which pass down the forearm, are attached by tendons to the phalanges of the fingers, and serve to flex or bend the fingers; and the *extensors* for extending the fingers. There are two muscles which flex all the fingers except the thumb. The thumb has a separate long and short flexor. There is a common extensor for the fingers which passes down the back of the forearm and divides at the wrist into four tendons, one for each finger, each being attached to all three phalanges. The forefinger and little finger have, in addition, each an extensor of its own, and the thumb has both a short and a long extensor. The tendons of the muscles of the hand are interlaced and bound together by bands and aponeurotic fibers, and from this results a more or less complete unity of action. It is sometimes difficult to make a movement with a single finger without the others taking part in it, as in executing instrumental music, for instance; but practice gives to these movements perfect independence. Of all the movements of the

hand the opposition of the thumb to the other fingers, alone or united, especially characterizes the human hand. This action of the thumb results from its length, from the first metacarpal bone not being placed on the same plane as the other four, as is the case in the monkey, and from the action of a muscle—the long flexor of the thumb—peculiar to the human hand. This muscle completes the action of the other motor of the thumb, and permits man to hold a pen, a graver, or a needle; it gives to his hand the dexterity necessary in the execution of the most delicate work. Properly speaking then, the hand, with its highly specialized muscles, belongs to man alone. It cannot be considered, as in the ape, as a normal organ of locomotion, though it is closely approached in structure in the highest apes. It is essentially the organ of touch and prehension. It molds itself to a body to ascertain its form; it comes to the aid of the eye in completing or rectifying its impressions. The functions of touch devolve principally upon its anterior or palmar face, the nervous papillæ abounding specially at the end of the fingers. A layer of adipose tissue, very close in texture, protects, without lessening its power or its delicacy, the network of muscles, vessels, and nerves, with which this remarkable organ is equipped.



Skeleton of Human Hand and Wrist.

1. Scaphoid bone. 2, Semilunar bone. 3, Cuneiform bone. 4, Pisiform bone. 5, Os trapezium. 6, Os trapezoides. 7, Os magnum. 8, Unciform bone. 9, Metacarpal bones of thumb and fingers. 10, First row of phalanges of thumb and fingers. 11, Second row of phalanges of fingers. 12, Third row of phalanges of thumb and fingers.

Handball, a game of ball, played without any instrument for striking, the hand only being used. The regulation handball court is from 60 to 65 feet long, and 22 to 25 feet wide. Two or four men can play, one or two on a side.

Handcuffs, an instrument formed of two iron rings connected by a short chain or fixed on a hinge on the ends of a very short iron bar, which being locked over the wrists of a malefactor, prevents his using his hands.

Händel (han'del; properly Haendel), George Frederick, a great German composer, born at Halle on the Saale, in 1685. The strong passion which he early showed for the art overcame his father's opposition to training him as a musician, and at the age of seven he was placed under the tuition of Zachau, organist of Halle Cathedral, and was soon so far advanced in the practical part of the science as to be able to officiate occasionally as deputy to his instructor. In 1696 he was sent to Berlin, where he heard the music of Bononcini and Ariosti, then at the head of the Berlin Opera House. He returned to Halle, was appointed organist of the cathedral in 1702, but soon left to visit Hanover and Hamburg, where Steffani and Reinhard Keiser, the latter the greatest German operatic composer of his day, resided. At Hamburg he played second violin in the orchestra, and brought out in 1704 his first work, an oratorio on the *Passion*, and his first opera, *Almira*, followed in February by his *Nero*, and subsequently by his *Florinda and Daphne*. In 1706 he went to Italy. On his return to Germany he entered the service of the Elector of Hanover, afterwards George I of England, as musical director. He visited England twice, and ultimately, having received a pension from Queen Anne, settled down there. For some years his popularity was very great. He was placed at the head of the newly-founded Royal Academy of Music, and accumulated a large fortune

George Frederick Händel

in spite of the heavy losses which he incurred by setting up an opera company in opposition to that supported by the leading nobility and the principal Italian singers. Amongst the operas which he had composed up to this date (1735) are: *Radamisto, Ottone, Giulio Cesare, Flavio, Tamerlano, Scipio, Ricardo I, Orlando, Ariadne*, etc. His last opera was performed in 1740. By this time he had begun to devote himself chiefly to music of a serious nature, especially the oratorio. The approval which his first works of this kind (*Esther*, 1731; *Deborah*, 1732; *Athalia*, 1733) had met with encouraged him to new efforts; and he produced in succession *Israel in Egypt, L'Allegro* and *Il Penseroso, Saul*, and *The Messiah*. The last-mentioned, which is his chief work, was brought out in 1741, for the benefit of the Foundling Hospital. It was not much appreciated at the first representation, but increased in reputation every year. In 1742 the *Samson* appeared, in 1746 the *Judas Maccabæus*, in 1748 the *Solomon*, and in 1752 the *Jephthah*. In 1752 he became blind, but did not lose his spirits, continuing to perform in public and even to compose. He died at London in 1759, and was buried in Westminster Abbey. Händel was of large and ungainly person. His manners were rough and his temper violent, but his disposition was humane and liberal. As a musician his characteristics are boldness and strength of style and combination of vigor, spirit, and invention in his instrumental compositions.

Hand-fish. See *Cheironectes.*

Handicapping, in horse-racing and various other games and sports, a system of equalizing the chances of victory in favor of each of the competitors by allowing certain advantages to an inferior competitor, as, in horse-racing, the making the best horses carry heavier weights proportionably to their racing qualities, or, in chess-playing, the stronger player giving up one or more of his men at the beginning of the game.

Hand-language. See *Deaf and Dumb.*

Hand-plant, the *Cheirostēmon platanoides*, a Mexican tree of the order Sterculiaceæ. It grows about 30 feet or more in height, and has flowers, the stamens of which present an appearance somewhat like that of the human hand.

Hands, LAYING ON OF. This rite, as a token of blessing, or the communication of spiritual gifts, or of something else which could not be literally delivered into the hands of another, has been in use from the earliest times. It occurs in Scripture as a patriarchal usage. In the early church this rite was used in benediction, absolution, the unction of the sick, and the reconciliation of penitents as well as in ordination and confirmation. The rite is still retained by most western churches in the ceremony of ordination, and in the Roman Catholic, Anglican, and Lutheran churches both in confirmation and ordination.

Hanford (han'ford), a city, county seat of Kings Co., California, 30 miles S. of Fresno, on the Southern Pacific and the Gulf, Colorado & Santa Fé railroads. Fruit growing and canning, farming and dairying are the principal industries. Pop. (1920) 5888.

Hang-Chow (häng'chou'), or HANG-CHOO, a large city, capital of the province of Chekiang, China, on the estuary of the Tsien-tang-kiang. It is one of the handsomest cities of China, with many magnificent temples, monuments, and triumphal arches. It has extensive manufactures in silks, furs, gold and silver ornaments, tapestries, lacquered ware, fans, etc., and a large trade. The larger portion of the inhabitants live without the walls in the beautiful suburbs and in boats on the river. It is also a great center of literary and ecclesiastical life. Pop. (1912) 594,000.

Hanging, as a mode of execution. See *Capital Punishment.*

Hanging-buttress, in architecture, a buttress not standing solid on a foundation, but supported on a corbel. It is applied chiefly as a decoration.

Hanging-buttress.

Hanging Gardens. The Hanging Gardens of Babylon were anciently reckoned among the wonders of the world. Their construction has been variously ascribed to the legendary Queen Semiramis and to Nebuchadnezzar. Diodorus and Strabo have given descriptions of them. They are said to have formed a square, with an area of nearly four acres, and rose in terraces, supported on masonry arches, to a height of 75 feet. They were irrigated from a reservoir built at the top, to which water was lifted from the Euphrates by a screw.

Hang-nest (*Icteridæ*), a popular name given to the American orioles, a family of finch-like perching birds, of brilliant black and color, the best known being the Baltimore oriole. They are so called from their curious purse-like nests, often about two feet long, with a hole for entrance near the bottom. See *Oriole*.

Hankow (hän'kou'; 'Mouth of the Han'), a town and river-port in China, in the province of Hupeh, at the junction of the Han with the Yang-tse-kiang; Han-yang being on the opposite bank of the Han, and Wuchang on the other side of the Yang-tse. The port was opened to foreign trade in 1862, and has become the chief emporium for the green-tea districts in the central provinces, which formerly sent their produce for export to Canton. Large steamers ascend to the town. In 1857 Hankow fell into the hands of the Taiping rebels, and was almost completely demolished by them. Pop. estimated at 850,000.

Hanley (han'li), a municipal and parliamentary borough of North Staffordshire, England, pleasantly situated on rising ground near the Trent, 18 miles north by west of the county town of Stafford. It is quite a modern town, owing its growth entirely to the vast manufactures of china and earthenware in which the inhabitants are mostly employed; but there are also iron-furnaces, foundries, brickworks, and several important collieries. Pop. (1911) 66,264.

Hanna (han'a), MARCUS ALONZA, senator, born at Lisbon, Ohio, in 1837; died in 1904. He grew wealthy in business, became active in political affairs, was chairman of the National Republican Committee in 1896, managed the McKinley presidential campaign, and was elected United States Senator in 1897. He continued chairman of the committee in the campaign of 1900.

Hannan (han'an), FREDERICK WATSON (1866-), an American Methodist Episcopal clergyman and theological instructor, born at Cochecton, N. Y., educated at Hackettstown Collegiate Institute and Wesleyan University, Conn. He was graduated from the Drew Theological Seminary in 1893, ordained to the Methodist Episcopal ministry and became pastor of a church at Bayport, N. Y. the same year. He was pastor of the First Church of Meriden, Conn., from 1894 to 1898, and pastor of the First Church of Waterbury, Conn., 1898-1901. Removing to Brooklyn he became pastor of the Bushwick Avenue Church in 1901, remaining there till 1909, when he accepted a call to the New York Avenue Church of Brooklyn. In 1913 he resigned the pastorate of the New York Avenue Church and became professor of Biblical Theology at the Drew Theological Seminary, Madison, N. J.

Hannay, JAMES, a Scotchman of letters, born at Dumfries in 1827; died at Barcelona in 1873. At an early age he entered the navy, but left it in 1845 to become a reporter on the *Morning Chronicle* in London. In 1860 he went to Edinburgh as editor of the Edinburgh *Courant*, but resigned this post in 1864. In 1868 he was appointed British consul at Barcelona. He wrote several novels, among which *Singleton Fontenoy* and *Eustace Conyers* are the best.

Hannibal (han'ni-bal), or ANNIBAL, one of the greatest generals of antiquity, born B.C. 247, was the son of Hamilcar Barca, also a general and leader of the popular party among the Carthaginians. He was but nine years of age when his father made him swear at the altar eternal hatred to the Romans. He grew up in his father's camp in Spain (see *Hamilcar*), but returned to Carthage when his father fell in battle, in 229 B.C. At the age of twenty-two he returned to the army in Spain, then commanded by his brother-in-law Hasdrubal, and three years after, on the murder of Hasdrubal, received the chief command by acclamation. Hannibal now prepared to carry out his great designs against Rome. His siege and capture of Saguntum, a city in alliance with Rome, led to a declaration of war from the Romans, who made preparations to carry on the war in Spain. But Hannibal, judging that Rome could be overthrown only in Italy, undertook his great march on Rome across the Pyrenees, the Rhône, and the Alps. He set out with 90,000 foot-soldiers, 40 elephants, and 12,000 horsemen. When he reached the northern foot of the Alps he had still 50,000 foot-soldiers, 9000 horse, and 37 elephants. When he arrived at the southern foot, after 15 days of incredible toils, his force had diminished to 20,000 foot-soldiers and 6000 horse. The point at which he crossed is generally believed to have been the Little St. Bernard. On the banks of the Ticino he first encountered a Roman army under Publius Scipio, and defeated it mainly by the superiority of his Numidian cavalry, 218 B.C. Shortly after another Roman army, under Sempronius, was totally routed on the Trebia. After wintering in Cisalpine Gaul, Hannibal opened next year's campaign (217) by defeating the Roman general Flaminius, whom he enticed into an ambush at Lake Thrasymenus. In this battle half the Roman army perished, and

the rest were taken prisoners. Hannibal now marched into Apulia, spreading terror wherever he approached. Rome, in consternation, proclaimed Fabius Maximus dictator, who sagaciously resolved to hazard no more open battles, but exhaust the strength of the Carthaginians by delay. But for some time the wisdom of this policy was not understood by his countrymen, who, dissatisfied with his inactivity, appointed Minutius Felix his colleague. The result was that the latter was drawn into a battle by Hannibal, and would have perished but for the aid of Fabius. After this the Roman generals avoided engagements, and Hannibal at this critical period saw his army wasting away in inactivity. Next year (216), however, the rashness of the new consul Terentius Varro gave Hannibal the last of his great victories. The battle was fought at Cannæ, the Romans under L. Æmilius Paulus and Varro numbering more than 80,000 men, the Carthaginians about 50,000, and ended in a total defeat of the Romans, 40,000 or 50,000 of whom were slain and the rest scattered. Instead of marching on Rome, Hannibal now sought quarters in Capua, where luxurious living undermined the discipline and health of his troops. The campaigns of 215, 214, and 213 were comparatively unimportant. While Hannibal was seizing Tarentum (212), Capua was invested by two Roman armies. To relieve Capua Hannibal marched on Rome, and actually appeared before its gates (211), but the diversion remained fruitless, and Capua fell. In 207 a reinforcement tardily sent by the Carthaginians to Hannibal, under command of his brother Hasdrubal, was intercepted by the Romans and destroyed at the Metaurus. Hannibal now retired to Bruttium (the toe of Italy), where he still maintained the contest against overwhelming odds, till, in 203, he was recalled to defend his country, invaded by Scipio. In Africa he was defeated by the Romans at Zama (202 B.C.), and the second Punic war ended, after a bloody contest of eighteen years, in Carthage having to accept the most humiliating conditions of peace. Hannibal now devoted himself as civil magistrate to restoring the resources of Carthage, and was working at reforms of administration and finance when the jealous Romans sent ambassadors to demand his surrender. He fled to the court of Antiochus of Syria, and offered his services for the war then commencing against the Romans. They were accepted, but Hannibal's advice for the conduct of the war was not followed, and he himself as commander of the Syrian fleet failed in an expedition against the Rhodians. In 190 B.C. Antiochus was forced to conclude a disgraceful peace with the Romans, one of the terms of which was that Hannibal should be delivered up. Hannibal, again obliged to flee, took refuge with Prusias, king of Bithynia, and is said to have gained several victories for Prusias against Eumenes, king of Pergamus, an ally of the Romans. But the Roman senate once more sent to demand the surrender of their inveterate enemy, and Hannibal, finding that Prusias could not protect him, took poison rather than surrender to the Romans. He died 183 B.C.

Hannibal, a city of Mario Co., Missouri, on the Mississippi, crossed here by a steel bridge, 120 miles N. of St. Louis, on 4 railroads. It was the boyhood home of Mark Twain. It manufactures cement, shoes, car wheels, structural steel, wood products, buttons, stoves, auto bodies and tires, etc. Pop. (1910) 18,341; (1920) 18,950.

Hanno (han'nō), a Carthaginian navigator of the fifth and sixth centuries B.C., who made a voyage on the western coast of Africa for the purpose of discovery and of settling colonies. He wrote an account of his voyage, which still survives in a Greek translation known as the *Periplus of Hanno.* From this account Hanno would appear to have gone as far as the coast of Guinea.

Hanoi (hä-noi'), or KESH'O, capital of Tonquin, on the river Songka, in a fruitful plain. Gold and silver filigree, lacquered wares, silks, mat and basket weaving are its principal industries. Although the river is navigable only for small vessels the trade of Hanoi is considerable, chiefly with the southern provinces of China. Pop. variously estimated at over 100,000.

Hanover (han'ō-vèr; Ger. *Hanno ver*), formerly a kingdom in the northwest of Germany, now a province of Prussia. It is of very irregular shape, and is divided by intervening territories into three distinct portions, besides some small territories to the south, and a range of sandy islands lining the coast. The total area is 14,857 sq. miles. For administrative purposes it is divided into six districts—Hanover, Hildesheim, Lüneburg, Stade, Osnabrück, Aurich. The surface in the south is covered by the Harz Mountains, but the rest of the country is a low, monotonous flat, with a gentle slope to the North Sea. The Ems, the Weser (with its tributaries the Leine and Aller), and the Elbe flow through fertile districts industriously cultivated for corn and flax. Near the coast the land is marshy, but feeds large numbers of very superior cat-

tle. In Central Hanover the soil is of a barren, sandy nature. The Harz Mountains are rich in minerals, the working of which is an important industry.—Hanover was long connected with the Brunswick family, and latterly more especially with the line of Brunswick-Lüneburg. Ernest Augustus, a prince of the latter line, became in 1692 the first Elector of Hanover, married a granddaughter of James I of England, and was succeeded in 1698 by his son, George Louis, who in 1714 became George I of England. Henceforth it was ruled in connection with England. In 1814 the Congress of Vienna raised Hanover to the rank of a kingdom, the crown of which was worn by George IV and William IV, but on the accession of Queen Victoria, passed by Salic law to Ernest Augustus, duke of Cumberland. In 1851 he was succeeded by his son, George V, but in 1866, Hanover having become seriously involved in the Austro-Prussian contest, his kingdom was conquered and absorbed by Prussia. Pop. 2,943,000.

Hanover, capital of the Prussian province of Hanover, situated in an extensive plain on the Leine, which here receives the Ihme and becomes navigable. The old town, irregularly built and with many antiquated buildings, is surrounded by the handsome new quarters which have arisen to the north, east, and southeast. There are fine promenades, and a large wood with beautiful walks, the Eilenriede, lies on the eastern side of the city. Amongst the principal buildings are the Market Church, the old town-house, the theater, one of the finest in Germany, the royal palace, the Museum of Art and Science, the Royal Library, containing 175,000 volumes, the Central Railway Station, the Waterloo Monument, etc. About a mile to the N. W. is Schloss Herrenhausen, the favorite residence of George I. George II, and George V. Nearer the town is the colossal Welfenschloss, or palace of the Guelphs, now fitted up as a polytechnic school. Hanover is a manufacturing town of some importance, has cotton-spinning, machine works, iron foundries, chemical works, tobacco and cigar factories, etc. Hanover is first mentioned in 1163. It joined the Hanseatic League in 1481. It became the residence of the dukes of Brunswick-Lüneburg, and capital of the principality in 1636. Pop. (1910) 302,378.

Hanover, a village of Grafton County, New Hampshire, near the Connecticut River and 75 miles N. W. of Concord. It is chiefly notable as the seat of Dartmouth College, founded in 1769 and prominent among our collegiate institutions. Pop. (1920) 2264.

Hanover, a borough of York Co., Pa., 18 miles S. W. of York. It has manufactures of wire cloth, cigar boxes, gloves, furniture, flour, silk, machine-shop products, etc. Pop. (1920) 8664.

Hanse Towns (hans), certain German and other commercial cities of Northern Europe formerly associated for the protection of commerce and united by what was called the *Hanseatic League.* In the middle of the thirteenth century the sea and land swarmed with pirates and robbers. In particular the thriving ports of the Baltic and the North Sea were infested, and in 1219 a compact was made between Hamburg, Ditmarsh, and Hadeln to protect the adjacent waters. This was followed in 1241 by an alliance between Hamburg and Lübeck to keep open the road across Holstein, connecting the North Sea with the Baltic. In 1247 this league was joined by Brunswick, and out of this grew the Hansa or league, which at its most flourishing period embraced 85 towns, maritime and inland, from Reval and Narva to Amsterdam and Middleburg, and from Cologne to Breslau and Cracow. Among these the town of Lübeck was recognized as the chief town of the league. Here assembled the deputies of the other Hanse towns to deliberate on the affairs of the confederacy; but the decrees of the diet had no effect unless they received the sanction of the separate towns. The chief trading centers of the league were the factories of Novgorod in Russia, Bergen in Norway, Bruges, and London (the so-called Steelyard). These factories were subject to an almost monastic discipline, which even required their officers to be celibates and live at a common table. During the latter half of the fourteenth century the power of the league was at its height. It had armies and navies, gained victories in war over the kings of Norway and Denmark, and deposed a king of Sweden. It made thorough provision for the security of commerce on the Baltic and North Seas, constructed canals, introduced a uniform system of weights and measures, and developed the principles of mercantile law. But as its power and ambition increased it was felt to be an oppressive monopoly established mainly in the interests of the great seaport towns. It became less needful also for commercial security, as the princes learned the advantages of trade, formed naval forces of their own, and encouraged navigation. Most of the inland members of the confederation withdrew, and during the fifteenth and sixteenth

centuries the cities of Hamburg, Lüneburg, and Lübeck were almost alone in their active efforts to maintain the power of the Hansa and secure for it the command of the Baltic. About the middle of the sixteenth century the Dutch became predominant in the Baltic trade. In 1597 England revoked all special privileges of the Hanseatic merchants, and in 1614 Lübeck, Stettin, Danzig, Brunswick, Lüneburg, Hamburg, Bremen, and Cologne, with a few smaller towns, were the only places that contributed to the support of the Hansa. The league still made desperate efforts to retain its monopolies, but the cost of doing so now became a heavy tax on the remaining allies. At the last general assembly, held in 1630 at Lübeck, many of the members sent representatives only to renounce their allegiance. The name still remained attached to the free cities of Lübeck, Bremen, and Hamburg, under whose protection the surviving factories continued to exist, that of Bergen being still managed in the old way till 1763. In 1813 Frankfort-on-the-Main was included in the number of the Hanse towns, and in the German Confederation these four cities had together one vote in the diet. Frankfort was incorporated with Prussia in 1866, but the other three towns are still separate constituents of the German Empire.

Hansi (hän'sē), a town of Hissar district, Punjab, on the western Jumna Canal. Pop. about 15,000.

Hansom-cab, a two-wheeled hackney carriage or cabriolet used in the cities and large towns of Britain and the United States, and named after the inventor. It holds two persons besides the driver, who sits on an elevated seat behind the body of the carriage, the reins being brought over the top.

Hanswurst (hän's'wurst), the name of a standing comic character on the older German stage, corresponding in its grotesque traits and mirth-making qualities to the English clown or Italian harlequin. The name is equivalent to the Jack Pudding of England.

Hants. See *Hampshire.*

Hanumân (han-ō-mân'), in Indian mythology, the name of a fabulous monkey-god, who plays a prominent part in the epic Râmâyana. As the monkey-general who aided Rama (the seventh incarnation of Vishnu) in his war against the giant Ravana, he is worshiped as a demi-god, and on his account the whole tribe of monkeys, to which he is fabled to belong, is treated as sacred and allowed to multiply indefinitely.

Hanway (han'wā), JONAS, an English traveler and philanthropist, born in 1712. At an early age he was apprenticed to a merchant at Lisbon, and in 1743 became a partner in a British house at St. Petersburg. He traveled in Persia, and published *An Historical Account of the British Trade over the Caspian Sea.* Later he settled in London, where he became widely known as an active philanthropist. He is popularly known as one of the first Englishmen to persist in the regular use of an umbrella. He died in 1786.

Hapsburg (haps'burg; properly *Habichtsburg* or *Habsburg*, the hawk's castle), a small place in the Swiss Canton of Aargau, on the right bank of the Aar. The castle was built about 1027 by Bishop Werner of Strassburg. Werner II, who died in 1096, is said to have been the first to assume the title of Count of Hapsburg. After the death, about 1232, of Rudolph II, the family divided into two branches, the founder of one of which was Albert IV. In 1273 Rudolph, son of Albert IV, was chosen Emperor of Germany, and from him descended the series of Austrian monarchs all of the Hapsburg male line, down to Charles VI inclusive. After that the dynasty, by the marriage of Maria Theresa to Francis Stephen of Lorraine, became the Hapsburg-Lorraine. Francis II, the third of this line, was the last of the so-called 'Holy Roman Emperors,' this old title being changed by him for that of Emperor of Austria. From the Emperor Rudolph was also descended a Spanish dynasty which began with the Emperor Charles V (Charles I of Spain), and terminated with Charles II in 1700. The Hapsburg régime in Austria-Hungary ended with Charles I in 1918.

Hara (hä'rà), TAKASHI (1854-1921), a Japanese statesman and journalist. He was for some time in the Foreign Office service, both at home and abroad, and became Premier in October, 1918. On his visit to America in 1908 he was received by President Roosevelt. He was for a time editor of the Osaka *Manichi.* On the eve of the Armaments' Limitation Conference at Washington he was assassinated at Tokio, Nov. 4, 1921.

Hara-Kiri (hä'ra-kē'rē), or (incorrectly) HARI-KARI, a Japanese method of suicide by disembowelment, formerly permitted to nobles and military officers so as to escape the indignity of a public execution or official disgrace. Still occasionally practised.

Harar (ha-rär'), a city of Northeastern Africa, about 150 miles from the coast of the Gulf of Aden. It is the center of a small district governed as an independent sovereignty by an emir. The inhabitants are strict Mohammedans. Pop. variously estimated from 30,000 to 40,000.

Harbin (här'bin), or KHARBIN, a railway town on the Sungari River, in Northern Manchuria, 615 miles N. E. of Port Arthur, 350 miles N. W. of Vladivostok. It was founded by Russia in 1896 at the junction of the Trans-Siberian Railway with the South Manchurian line to Port Arthur, as a railway and military center, and has now a population estimated at over 70,000. It has steamboat connections via the Sungari with the Amur and is a trading center. In 1904 it was an important depôt of supplies for the Russian army during the war with Japan.

Harbor (här'bur), a general name given to any bay, creek, or inlet of the sea affording accommodation for ships and protection against the wind and sea. The great requisites of a good harbor are accessibility, adequate depth of water, and shelter from violence of wind and water. Harbors are either natural or artificial, the latter being made wholly or partly by the construction of moles or breakwaters. In connection with the more important harbors there are usually docks, in which the water is kept as nearly as possible at the same level, thus giving facility in loading and unloading. See *Breakwater* and *Docks*.

Harbor Grace, a seaport of Newfoundland, on the west side of Conception Bay. It is the seat of a Roman Catholic bishop, has a handsome cathedral, and an active trade. Pop. 5184.

Harburg (här'bourg), a town in Prussia, in the province of Hanover, on the left bank of the South Elbe, opposite to Hamburg. It has varied manufactures and an important trade. Pop. (1910) 67,028.

Harcourt (här'cört), SIR WILLIAM GEORGE GRANVILLE VENABLES VERNON, lawyer and politician, son of the late Rev. William Vernon Harcourt, was born in 1827. He was educated at Trinity College, Cambridge, was called to the bar in 1854, became Queen's Counsel in 1866; contributed frequently to the press, in particular the letters to the *Times* signed 'Historicus.' He was returned for Oxford city in 1869 in the Liberal interest and distinguished himself by his powers of satire and ridicule in debate: was made solicitor-general in Mr. Gladstone's ministry, Nov., 1873; home secretary in 1880, when he lost his seat for Oxford but was returned for Derby. In Feb., 1886, he was made chancellor of the exchequer; and after the resignation of Mr. Gladstone's ministry became a prominent leader of the Gladstonian section; in 1892 he was reappointed chancellor of the exchequer. He died in 1904.

Hardangerfjord (här-däng'érfyord), a fjord on the west coast of Southern Norway, with magnificent scenery.

Hardee (här'dē), WILLIAM J., soldier, born at Savannah, Georgia about 1818; graduated at West Point in 1838; became captain in 1844, and joined the Confederate army in 1861. He served as major-general at the battle of Shiloh, and was appointed lieutenant-general in October, 1862. He fought at Stone River and in several later battles, and unsuccessfully defended Savannah against Sherman in 1864. His work on *Tactics* was long an authority. He died in 1873.

Hardenberg (här'den-bérg), FRIEDRICH VON, German writer, better known under the name of *Novalis*, was born in 1772; died in 1801. He studied at Jena, Leipzig, and Wittenberg, was the friend of Tieck and the Schlegels, and spent his brief life in study and literary production. He was one of the leaders of the 'romantic school,' and his writings are a strange mixture of imagination, profundity and mysticism. Amongst his works are an unfinished novel, *Heinrich von Ofterdingen*, and *Spiritual Songs*.

Hardenberg, KARL AUGUST, PRINCE VON, Prussian chancellor of state, was born at Essenrode, in Hanover, in 1750. He entered the civil service of his country, but left it for that of Brunswick, and next became Prussian minister of state, and in 1804 first minister of Prussia. His conduct was vacillating, now favoring an alliance with Napoleon and again hostile to him. After the Peace of Tilsit, he was banished from the Prussian court by command of Napoleon, was recalled to office as chancellor in 1810, and after the French disaster at Moscow was amongst the first to declare that the time had now come for a general effort against Napoleon. Hardenberg signed the Peace of Paris, and was created prince. He was one of the most prominent actors at the Congress of Vienna; became president of the Prussian council of state; was present in 1818 at the Congress of Aix-la-Chapelle; in 1819 at Carlsbad; in 1820 at Troppau; in 1820-21 at Laibach; and in 1822 at Ve-

rona. He died in 1822. He abolished feudal privileges in Prussia, and was a munificent patron of the sciences.

Harderwijk (här'dėr-vīk), a town of the Netherlands, in the province of Gelderland, on the Zuider Zee, 30 miles east of Amsterdam. Pop. 7425.

Hard-hack, the American popular name of a plant, the *Spiræa tomentosa*, common in pastures and low grounds, and celebrated for its astringent properties, which cause it to be used medicinally.

Hardicanute (här-di-kȧ-nūt'), or HARTHCANUT, King of England and Denmark, was the only legitimate son of Canute. At the time of his father's death, in 1036, he was in Denmark, where he was immediately recognized as king. His half-brother Harold, however, who happened to be in England at the time, laid claim to the throne of that part of their father's dominions, and succeeded in getting possession of Mercia, Northumbria, and Wessex, but died in 1040, when Hardicanute peacefully succeeded him. He reigned till 1042, leaving the government almost entirely in the hands of his mother and the powerful Earl Godwin, while he gave himself up to feasts and carousals.

Hardie (här'di), JAMES KEIR (1856-1915), a British labor leader, born in Scotland. He began work in the coal mines at the age of eight. He founded the *Labor Leader* and was the first Labor member of the House of Commons.

Harding (här'ding), WARREN G(AMALIEL), twenty-ninth president of the United States. Born at Corsica, Morrow Co., Ohio, Nov. 2, 1865, educated at the Ohio Central College (now non-existent). He studied law, but took up newspaper work at Marion, Ohio, in 1884, and became president of the Harding Publishing Co., publishers of the Marion *Star*, a daily paper. In 1891 he married Florence Kling of Marion. He served as a member of the Ohio senate from 1900 to 1904, and was lieutenant-governor of Ohio 1904-06. He was the Republican nominee for governor of Ohio in 1910, but was defeated by Governor Harmon, re-elected. Elected to the U. S. Senate in 1914 he was one of those who opposed the ratification of the Treaty of Peace with Germany (q. v.) as presented by President Wilson. The treaty contained the Covenant of the League of Nations (q. v.) and Mr. Harding joined with the senators who objected to the United States entering a league in which they were obligated to defend and protect the territorial integrity of member nations, as provided by article ten. He was the nominee of the Republican party for president in 1920, and the question of the League of Nations was one of the great issues of the campaign. Governor Cox of Ohio, the nominee of the Democratic party, was in favor of going into the league, and Mr. Harding favored remaining out unless the Covenant was vitally changed. Harding won the election by an overwhelming majority, the electoral vote being: Harding, 404; Cox, 127. He was inaugurated March 4, 1921. One of his first acts was to urge ratification of the pending treaty with Colombia. The treaty, which provides for the payment of $25,000,000 to Colombia by the United States, was ratified by the U. S. Senate April 20; by the Colombian Congress December 24, 1921. The outstanding event of President Harding's first year of administration was the Conference on the Limitation of Armaments, which convened, upon his invitation, at Washington, November 11, 1921. See *Armaments' Limitation Conference.*

Hardness (härd'nes), the quality of bodies which enables them to resist abrasion of their surfaces. In mineralogy a scale is used in which a set of standard bodies are arranged and numbered, and other bodies are referred to this scale with respect to hardness. The following is the scale given by F. Mohs: (1) talc, (2) gypsum, (3) calcite, (4) fluorite, (5) apatite, (6) felspar, (7) quartz, (8) topaz, (9) sapphire, (10) diamond. Where greater precision in the determination of hardness is required, an instrument called a 'sclerometer' is employed.

Hardouin (ȧr-dö-aṇ), JEAN, a learned French Jesuit, born in 1646; died in 1729. He maintained the extraordinary hypothesis that all the writings under the names of the Greek and Roman poets and historians, except those of Homer, Herodotus, Cicero, and Pliny the Elder, the satires and epistles of Horace, and the Georgics of Virgil, are the spurious productions of the thirteenth century, written by monks under the direction of one Severus Archontius.

Hardpan, a strata of hardened clay sand, or gravel, several feet under the soft upper soil, for which it serves as a foundation, and aids in holding water. It has become a popular term for the lowest point of descent in any state of affairs.

Hardwar (hur-dwär'), a town of India, in Saharanpur district, Northwestern Provinces. It is situated on the Ganges, and is one of the principal places of Hindu pilgrimage, and of the ceremonial of bathing in the sacred

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WARREN GAMALIEL HARDING

Twenty-ninth President of the United States. Born in Ohio in 1865, he became owner and editor of the Marion *Star;* was elected to the United States Senate in 1914; and took office as President in 1921. Among the notable events of his administration was the great Conference on the Limitation of Armaments, which convened, on his invitation, at Washington in 1921–22.

river. The town is of great antiquity and has interesting ruins. Pop. 25,597.

Hardware (hărd'wār), the name usually given to the commoner articles made of iron, brass, and copper. The manufacture of such articles now forms a gigantic industry in Great Britain, especially in England, where its chief seats are Birmingham and Sheffield.

Hardwood Trees, are usually trees of slow growth, such as the oak, beech, witch-elm, elm, ash, service-tree, walnut, chestnut, acacia, etc., the tissue of which is firm and close. They are distinguished from softwooded trees such as the willow, poplar, etc., and resinous trees such as the pine, fir, cedar, larch, etc.

Hardy (hār'di), THOMAS, novelist, born in Dorsetshire, England, in 1840. He served an apprenticeship as an ecclesiastical architect; published his first novel, *Desperate Remedies*, in 1872, and has since continued a series of favorite fictions. His best known work is *Far from the Madding Crowd*, with its fine air of rural life. Others are *The Hand of Ethelberta, The Trumpet Major, The Woodlanders, The Return of the Native, The Mayor of Casterbridge, Tess of the D'Urbervilles*, etc.

Hare (hār), the common name of the rodent quadrupeds of the genus *Lepus* with long ears, long hind limbs, a short tail, soft hair, and a divided upper lip; its dental formula is: incisors $\frac{4}{2}$, canines $\frac{0}{0}$, molars $\frac{6}{6} - \frac{6}{6} = 28$; the two forefeet have five and the hinder four toes. They run by a kind of leaping pace. The females produce litters of three to six about four times a year. The young leverets have their eyes open at birth. The common hare (*L. timidus*) is found throughout Europe and some parts of Asia. It is tawny red on the back and white on the belly, and is about 2 ft. long. The mountain hare or varying hare (*L. variabilis*), confined to Northern Europe and the mountainous regions of the south, is smaller than the common hare, and becomes white in winter. *L. cunicŭlus* is the rabbit, properly so called, distinguished by its smaller size and burrowing habits. (See *Rabbit.*) The American hare (*L. Americanus*), not much larger than a rabbit, is found in most parts of North America. In North America there are also the polar hare (*L. glacialis*), a variety of the varying hare (*L. variabilis*), but of superior size and purer color; and the prairie hare (*L. campestris*), one of the species known as jackass hares or Jack-rabbits, from their size and length of limb. The hare, which has no courage and little cunning, is protected from its enemies mainly by the acuteness of its sight and hearing and its extraordinary swiftness of foot. Its voice is never heard except when seized or wounded, when it utters a sharp loud cry, not very unlike that of a child. Its flesh is rather dry, but is much prized for its peculiar flavor.

Hare, JULIUS CHARLES, an English writer on theological and social subjects, born in 1796; died in 1855. He was educated at the Charterhouse, and Trinity College, Cambridge. In 1832 he became rector of Herstmonceaux, in 1840 was appointed Archdeacon of Lewes, in 1851 obtained a prebend in Chichester Cathedral, and in 1853 became one of the queen's chaplains. In concert with his brother, Augustus William Hare, he published a well-known work entitled *Guesses at Truth by Two Brothers.* His other writings include several volumes of sermons; a *Memoir of John Sterling*, prefixed to a collection of his writings; and a *Vindication of Luther Against His Recent English Assailants.*

Hare, ROBERT, chemist, born at Philadelphia, Pennsylvania, in 1781; died in 1858. He was professor of chemistry in the University of Pennsylvania, 1818-47, and gained fame by the invention of the oxyhydrogen blowpipe. He also invented the valve-cock, the calorimeter, etc. He investigated spiritualism and became convinced of its truth, being the first scientist to accept it.

Harebell (hār'bel), the Scotch BLUEBELL (*Campanŭla rotundifolia*), a plant of the nat. order Campanulaceæ, common on dry and hilly pastures, by roadsides, etc., in most districts of Europe, with a bell-shaped blue (sometimes white) flower. The radical leaves are cordate or reniform, the stem-leaves partly ovate or lanceolate, partly linear. Its slender stem is from 4 to 6 inches high, and bears sometimes a single flower. Several American species of *Campanŭla* are known to all lovers of wild flowers.

Harebell.

Hareld (har'eld; *Harelda glacialis*), the long-tailed duck, an oceanic duck having a short thick bill, a high forehead and two very long feathers in the tail of the male, whilst the females have the tail short and rounded. It inhabits the northern seas, and is frequent in Orkney and Shetland.

Harelip, a malformation consisting in a fissure or vertical division of the upper lip, sometimes extending also to the palate. Children are frequently born with this malformation, and the cleft is occasionally double. The name is given from the imagined resemblance which the part has to the upper lip of a hare. The cure of harelip is performed by cutting off quite smoothly the opposite edges of the fissure, and then bringing them together and maintaining them in accurate apposition till they have firmly united.

Harem (hā'rem, ha'rem; Ar., 'the prohibited'), is used by Mussulmans to signify the women's apartments in a household establishment, forbidden to every man except the husband and near relations. The women of the harem may consist simply of a wife and her attendants, or there may be several wives and an indefinite number or concubines or female slaves, with black eunuchs, etc. The greatest harem is that of the Sultan of Turkey. The women of the imperial harem are all slaves, generally Circassians or Georgians. Their life is spent in bathing, dressing, walking in the gardens, witnessing the voluptuous dances performed by their slaves, etc. The women of other Turks enjoy the society of their friends at the baths or in each other's houses, and appear in public accompanied by slaves and eunuchs; but the women of the sultan's harem have none of these privileges. It is of course only the richer Moslems who can maintain harems; the poorer classes have generally but one wife.

Hare's Ear (*Bupleurum*), a plant of the nat. order Umbelliferæ. The most common European species (*B. rotundifolium*) flourishes best on a chalky soil. Under the name of *thorough-wax* it was at one time used as a vulnerary.

Harfleur (ar-fleur), a town of France, dep. of Seine-Inférieure, on the Lezarde, near its entrance into the Seine, 6 miles east of Havre, once the chief port at the mouth of the Seine. Pop. 2612.

Hargreaves (här'grēvz), EDMUND X, explorer, born in Gosport, England, in 1815; became a gold-digger in California in 1849, and being struck with the similarity in geological formation between California and Australia, believed that gold existed in the latter. This he proved in 1856 by discovering gold in the Blue Hills of New South Wales. He was appointed commissioner of crown lands and received an award of $50,000. He died in 1891.

Hargreaves (här'grēvz), JAMES, an English inventor, author of two important improvements in the art of cotton-spinning, was born near Blackburn about 1720; died in 1778. In 1760 he invented a machine for carding, and some years after the spinning-jenny, by which he was able to spin with several spindles at once.

Haricot (har'i-kō), a general term for various species of kidney-bean, genus *Phaseolus*. They constitute a palatable and nutritious article of diet.

Häring (hā'ring), WILHELM, best known as Wilibald Alexis, a German novelist, born in 1797; died in 1871. He adopted law as a profession, but gave it up in favor of literature. In 1823 and 1827 respectively he published the novels *Walladmor* and *Schloss Avalon*, which were translated into English and other languages. These were followed by a long series of writings, consisting not only of novels and novelettes, but of books of travel, plays, ballads, etc. His most important works, however, were historic novels, such as *Cabanis*, *Roland von Berlin*, *Der Falsche Waldemar*, etc.

Harington (har'ing-tun), SIR JOHN, an English poet of some merit, born in 1561; died in 1612. At his baptism Queen Elizabeth stood sponsor. He was in 1596 excluded from court on account of his poem *Metamorphoses of Ajax*, but was soon allowed to return. His best-known performance is, perhaps, his translations of *Orlando Furioso* in heroic verse.

Harîri (har'ē-rē), ABU MOHAMMED EL KASEM BEN ALI, surnamed El Harîri, or the silk merchant, his father's occupation, a celebrated Arabic scholar and poet, who lived chiefly at Bassorah in the time of the Abbasside caliphs, born A.D. 1054; died 1121 or 1123. He is best known by his *Mekâmât*, a collection of tales narrated as incidents in the life of the hero *Abu Zeid*, a clever impostor who adopts every career in life, and succeeds in all to admiration.

Harlan, JOHN MARSHALL, American jurist, born in Kentucky in 1833; died in 1911. In 1861 he organized the Tenth Kentucky Regiment, of which he was colonel until 1863, when he became attorney-general of Kentucky. In 1877 he became an Associate Justice of the United States Supreme Court, in which position he showed himself a liberal constructionist. In 1889 he became professor of law in the George Washington University. He was a member of the Bering Sea Tribunal in 1893.

Harland, Marion. See *Terhune, Mary Virginia.*

Harlebeke, or HAERLEBEKE (här'-le-bā-ke), a town in Belgium, in West Flanders, on the Lys. It is said to be the oldest town in Flanders, and has a beautiful parish church, and a pulpit regarded as a masterpiece of carving. Pop. 7386.

Harleian Library. *See Harley.*

Harlequin (här'le-kwin; Fr. *arlequin;* Ital. *arlecchino*), a character of the Italian comedy. On the Italian stage he is a comic character, full of drolleries, tricks, and knaveries, and somewhat resembles the English clown. The harlequin of British pantomimes is quite different. He is supposed to be the lover of the columbine, and possesses a wonder-working wand, with which he protects his mistress against the clown and pantaloon, who pursue and endeavor to capture her, until the pursuit is brought to a termination by a good fairy. The harlequin wears a tight dress of bright colors, and glittering with spangles. See *Clown.*

Harlequin Duck (*Clangula histrionica*), a species of duck, so called on account of its party-colored plumage of white, gray, and black. It inhabits the Arctic regions. At Hudson Bay it is called the *Painted Duck;* along the coast of New England the *Lord.* In length it is about 17 inches. The bill is of a lead color, tipped with red. The upper part of the head is black. Between the eye and the tail is a broad space of white, extending over the eye, and ending in a reddish color. The neck is black and is encircled at the base with a line of white. The belly and upper body are black; the sides chestnut. It swims and dives well and is frequently seen in deep water considerably out at sea. It bred in Audubon's time in Nova Scotia and Labrador.

Harley (här'li), CHARLES RICHARD (1864-), an American sculptor, born at Philadelphia, educated in art at the Philadelphia Academy of Fine Arts and various schools in Paris. He was awarded a medal for sculpture at the Buffalo Exposition, 1901. Fine examples of his work are at Portsmouth, New Hampshire; Boston, Mass.; Brunswick, Maine; and the Harvard Stadium at Cambridge, Mass.

Harley, ROBERT, Earl of Oxford, an English minister, born 1661; died 1724; the son of Sir Edward Harley. After the accession of Anne he and his colleague St. John, afterwards Lord Bolingbroke, became leaders of the Tories. Harley was chosen speaker of the House of Commons in 1702 under Rochester, and in 1704 was appointed chief secretary of state, but resigned in 1708. After the fall of Marlborough Harley became chancellor of the exchequer in 1710, and next year was created Earl of Oxford. He and Bolingbroke secured the Treaty of Utrecht (1713), but afterwards quarreled. Early in the reign of George I he was impeached of high treason on the ground of his alleged Jacobite intrigues. He was kept in the Tower for two years, but, owing to the inability of the Peers and the Commons to agree about the mode of procedure he was acquitted. His patronage was extended to Swift, Pope, and other literary men, and he made a valuable collection of books and MSS., which latter are preserved in the British Museum, where they form the *Bibliotheca Harleiana.* Those which have been printed constitute the *Harleian Miscellany.*

Harlingen (här'ling-en), a seaport of Holland, province of Friesland, intersected by numerous canals. It has a great trade with England in corn, cattle, butter, etc. Pop. 10,448.

Harmattan (här-mat'an), a hot and dry wind, which, coming from the interior of Africa, prevails at times on the coast of Guinea in December, January, and February. Under its influence vegetation withers, and the grass becomes like hay. It is similar to the simoon of Egypt and the sirocco of Italy.

Harmodius (här-mō'di-us). See *Hippias* and *Aristogeiton.*

Harmon (här'mon), JUDSON, governor, was born at Newton, Ohio, in 1846. He studied law, became mayor of Wyoming, Ohio, in 1875; judge of the Court of Common Pleas in 1876 and of the Superior Court in 1878, and in 1895-97 was Attorney-General of the United States in the Cleveland cabinet. He became professor of law in the University of Cincinnati in 1896, and was elected governor of Ohio by the Democratic party in 1909.

Harmonica.

Harmonica (här-mon'i-ka), Franklin's name for a musical instrument constructed with glasses of different sizes, revolving by means of mechanism

worked by the foot, and played upon by touching the rim of the glasses with the moistened finger. It constituted the 'musical glasses' of Goldsmith's era. The name is now usually applied to an instrument consisting of a series of glass keys played by two small hammers.

Harmonics (hâr-mon'iks), the accessory sounds accompanying the predominant and apparently simple tone of any string, pipe, or other sonorous body. No purely simple sound, *i. e.* no sound whose vibrations are all in the same period, is producible in nature. When a sound is produced by the vibration of an open string, the whole string vibrates as a unity, giving rise to a tone called the fundamental. The string, however, further divides into various sections, which vibrate separately and more rapidly, and produce sounds differing from the fundamental, but bearing certain fixed proportions to it. The first harmonic of the fundamental note of any string is that produced by half the string, and is the octave of the first; the second harmonic is given by the third of the string, and is the fifth or dominant of the fundamental note, and so on, the complete series of harmonics containing all the notes of the musical scale. But while harmonics enter into the composition of any musical sound from any vibrating body whatsoever, the different structure of different instruments suppresses now some now others of the succession of harmonics, and a different body of tone is thus produced, distinguishing a note in one instrument from the same note in another. These differences are called in English *quality*, in French *timbre*, in German *klangfarbe*.

Harmonists (hâr'mon-istz), a religious sect founded at Würtemberg about the year 1788 by two brothers called George and Frederick Rapp. They endeavored to re-establish the social practices of the early Christian church, encouraged celibacy, held all their goods in common, and taught the second advent. Persecuted by their countrymen, the followers of Rapp emigrated to America, and established themselves (1805) successfully at Harmony, in Pennsylvania. They afterwards migrated to Indiana, but this venture not proving successful, they sold their land at New Harmony to Robert Owen, the socialist, and finally settled at a place which they named Economy, 17 miles from Pittsburgh. George Rapp died in 1847, but the community still exists, though reduced to a very small number of members as a result of its policy of celibacy. It has, however, a property of great value.

Harmonium (hâr-mō'ni-um), a musical instrument of modern invention, producing sounds somewhat resembling those of the organ, resulting from the pressure of wind on a series of vibrating metallic reeds. By the action of bellows, to which the feet communicate a more or less rapid movement, the air is made to impinge against thin tongues of metal (here termed *reeds*), and to set them vibrating. These metal tongues are fitted into a slit in the top of a small box or sonorous cavity, called a wind-box, and are enabled to vibrate by being fixed only at one end. The discovery that the form of the wind-boxes determines the quality of the sound produced by the vibration of these metallic tongues contributed very much to the development of the harmonium, as it enabled the player to imitate the sound of the oboe, flute, etc. The instrument has a keyboard like that of a piano, and when one of the keys is pressed down a valve is opened, which allows the wind from the bellows to rush through one of the wind-boxes and act on the vibrator. There are several stops, by means of which the performer can direct the stream of wind into the wind-boxes which produce a flute, clarionet, or any other sound. There is also a knee action, which either serves as an expression stop, or brings all the stops of the instrument into play at once, and what is called the percussion action, which consists in the application of a small hammer, which strikes the vibrator as soon as the key is pressed down, and thus aids the action of the wind. The better class of harmoniums have now usually two or more extra rows of vibrators, which, acted upon by separate stops, add so many octaves to the compass.

Harmony. See *Music* and *Counterpoint*.

Harmony (hâr'mo-ni), Evangelical, or Harmony of the Gospels, the title of works written with a view to prove the substantial agreement of the four evangelists. The heretic Tatian composed in the second century the *Diatessaron*, the first work of this kind, a continuous narrative of the events written in the gospels. From this harmony all passages were omitted which favored the doctrine of the real humanity of Christ, and hence told against the peculiar doctrines of Tatian. Theophilus of Antioch is said to have composed a book of a similar kind, and Ammonius Saccas (died 243 A.D.) executed another *Diatessaron*, with the corresponding passages arranged in parallel columns. The *Ten Indexes* of Eusebius probably appeared in

the first half of the fourth century, and was more complete than its predecessors. Among modern harmonists are Gresswell, Robinson, Tischendorf, etc.

Harmony of the Spheres, an hypothesis of Pythagoras and his school, according to which the motions of the heavenly bodies produced a music imperceptible by the ears of mortals. He supposed these motions to conform to certain fixed laws, which could be expressed in numbers corresponding to the numbers which give the harmony of sounds.

Harmotome (här'mo-tōm), or CROSS-STONE, a mineral which occurs in right rectangular prisms terminated by four rhombic planes corresponding to the solid angles of the prism; but more frequently in twin-crystals formed by the intersection of two flattened prisms at right angles to each other. Its prevailing color is white, and it is hard enough to scratch glass.

Harnack (här'nâk), ADOLPH, a German theologian, born at Dorpat in 1851. In 1889 he was called to Berlin, where his lectures attracted students from all over the world. He regards the development of dogma as a deleterious process of interfusion of Greek forms of thought with the gospel teaching. His *Lehrbuch der Dogmengeschichte*, translated as the *History of Dogma* (1895-1900), is an epoch-making work.

Harness (hâr'nes), the various articles which are required to yoke a horse or another animal to any vehicle. See *Bit*, *Bridle*, *Saddle*, etc.

Harold I (har'old), or HARALD (*Hagager*; 'Beautiful-haired'), King of Norway, one of the greatest monarchs of that country, succeeded his father in 863. He brought all the Norwegian jarls under his power, and completely subjected the country. Of the conquered jarls, Horlf, or Rollo, emigrated to Neustria (France); others established themselves in Iceland, the Shetland Isles, the Faroes and the Orkneys. In consequence of their incursions into his dominions, Harold embarked with a naval force to subdue them, and having conquered the Orkneys, etc., returned home. He fixed his residence at Trondhjem, and died there in 933.

Harold III (*Hardrada*, 'the Hardy'), King of Norway, the son of Sigurd, a descendant of Harold Haarfager. In his youth he went to Constantinople and took part in the expedition to Italy against the African pirates. He was ultimately appointed commander of the imperial bodyguard, and defeated the Saracens. About 1042 he returned to Norway, after having, on his way through Russia, married the daughter of the Grand-duke Jaroslav. In 1047 he succeeded his nephew, Magnus the Good, as sole king of Norway. In 1066 he joined Tostig, the brother of Harold II of England, in an invasion of that country, but was defeated and slain at the battle of Stamford Bridge. See *Harold II* below.

Harold I, surnamed *Harefoot*, Danish king of England, succeeded his father Canute in 1035 as king of the provinces north of the Thames, and became king of all England in 1037. His countrymen, the Danes, maintained him upon the throne against the efforts of Earl Godwin in favor of Hardicanute; and Harold later gained the earl over. After a reign of four years, he died in 1040.

Harold II, King of England, born about 1022, was the second son of Godwin, earl of Kent. On the death of Edward the Confessor, January 5, 1066, he stepped without opposition into the vacant throne, without attending to the claim of Edgar Atheling, or the asserted bequest of Edward in favor of the duke of Normandy. The latter immediately called upon him to resign the crown, and upon his refusal prepared for invasion. He also instigated Harold's brother, Tostig, to infest the northern coasts of England in conjunction with the king of Norway. (See *Harold III* above.) The united fleet of these chiefs sailed up the Humber, and landed a numerous body of men; but at Stamford Bridge, in Yorkshire, were totally routed by Harold, whose brother Tostig fell in the battle. Immediately after he heard of the landing of the duke of Normandy at Pevensey, in Sussex. Hastening thither with all the troops he could muster, a general engagement ensued at Senlac, near Hastings, October 14, 1066, in which Harold was slain, and the crown of England passed to William.

Haroun al Raschid. See *Harun al Rashid.*

Harp, a stringed instrument of great antiquity, found among the Assyrians, Egyptians, Hebrews, Greeks, Irish, Welsh, and other nations. Its variety of form and construction was only equalled by its universality. The modern instrument is well known: its form is nearly triangular, and the strings distended from the upper part to one of the sides. It stands erect, and is played with both hands, the strings being struck or pulled with both fingers and thumbs. The instrument in its ancient forms was very defective. Egyptian harps are represented with four, seven, ten, twenty, or

more strings, but we have little idea of the scale to which they were tuned. The frames are depicted as being curved in various forms, and the front pillars are wanting. The harps of the Hebrews were probably similar to the Egyptian instruments. It is probable that the various

Ancient Harps.
1, 2, Egyptian. 3, Assyrian. 4, Anglo-Saxon.

Celtic harps were derived from some oriental pattern. Among the Anglo-Saxons the harp was a favorite instrument. The modern harp was by no means an efficient instrument, until pedals were invented, an invention finally perfected by Sebastian Erard, whose patent was taken out in 1795. In 1810 he patented a double-action harp with seven pedals, each effecting two changes in the pitch of the strings. The harp thus constructed contains forty-three strings tuned according to the diatonic scale, every eighth string being a replicate in another octave of the one counted from.

Harp, ÆOLIAN. See *Æolian Harp.*

Harpe. See *La Harpe.*

Harper, WILLIAM RAINEY, educator; born in New Concord, Ohio, in 1856; graduated at Muskingum College in 1870. He became professor of Hebrew at the Baptist Union Theological Seminary, Chicago, in 1879-1886; of Semitic languages at Yale College in 1886-1891; president of the University of Chicago in 1891. He was very successful in promoting its interests, benefited by the liberal donations of John D. Rockefeller. He died in 1906.

Harper's Ferry, a town of West Virginia, on the Potomac River and at the mouth of the Shenandoah, 81 miles west of Baltimore. The Potomac here passes through a gorge in the Blue Ridge, and the town is notable for the beauty of its scenery and as the seat of memorable events. In 1859, John Brown, the noted abolitionist, captured the United States arsenal at this place, with a view to promote a slave insurrection. He was taken and executed. In 1862 the place was captured by Stonewall Jackson and a large garrison taken prisoners. It was the scene of other events during the Civil war. There is here a college for colored students. Pop. 766.

Harpies (här'pēz), the ancient Greek goddesses of storms. Their parentage, ages, appearance, names, and number are very differently given by the poets. In the Homeric poems they are merely storm-winds. Hesiod represents them as two young virgins of great beauty called Aëllo and Ocypete. The later poets and artists vied with each other in depicting them under the most

Harpy, from an antique gem.

hideous forms, covered with filth and polluting everything in contact with them. They are often represented as having female faces.

Harpoon (här-pön'), one of the principal instruments used for the capture of whales and large fish. See *Whale.*

Harp-seal. See *Seal.*

Harp-shell, the shell of a genus of molluscs (*Harpa*) belonging to the gasteropoda and to the whelk family. The species are found more especially at the Mauritius. The shells are very beautiful, being of brilliant color.

Harpsichord (härp'si-kord), a keyed, stringed in-

strument formerly in use, in appearance and construction similar to a grand pianoforte. In the front the keys were disposed, the long ones being the naturals, and the short ones the sharps and flats. These keys being pressed by the fingers, their inclosed extremities raised little, upright, oblong slips of wood called *jacks*, furnished with crow-quill plectrums which struck the wires, instead of the hammers of the modern pianoforte.

Harpy-eagle (*Thrasaëtus Harpyia* or *Harpyia destructor*), a rapacious bird which inhabits tropical America from Southern Mexico to Southern Brazil. It is an extremely powerful bird, and in total length slightly in excess of the golden eagle. It has, however, a somewhat shorter expanse of wing. Its shoulder muscles possess enormous strength. Its bill is powerful and crooked, and its claws are extremely strong and sharp. The harpy-eagle feeds on birds, sloths, fawns, raccoons, etc., as well as on fish, water-snakes, and the eggs of the tortoise.

Harquebuse (här'kwē-bus). See *Arquebus*.

Harraden, Beatrice, novelist, born in London about 1864. Her novel, *Ships That Pass in the Night* (1893), was very successful. Others from her pen were *In Varying Moods*, *Hilda Strafford*, etc.

Harrier (har'i-ẽr), a kind of dog employed to hunt the hare. It closely resembles the foxhound, but is smaller in size.

Harrier, the name of several hawks of the genus *Circus*, allied to the buzzards. They strike their prey upon the ground and generally fly very low. The marsh-harrier, the hen-harrier, and the ash-colored harrier, are found in Europe, and the marsh-harrier (*C. ærugĭnōsus*) in North America and Cuba. It is from 21 to 23 inches long. The hen-harrier (*C. cyanĕus*) is 18 inches to 20 inches long. It is very destructive to poultry-yards, whence the name.

Harriman, Edward Henry, railroad financier, was born at Hempstead, New York, in 1847. He engaged early in the brokerage business in New York and was a member of the Stock Exchange at 22. Active and enterprising as a broker, he engaged vigorously in railroad finance, was made a director of the Illinois Central R. R. in 1883, was later its vice-president and acting president, and in 1898 secured a controlling interest in the Union Pacific R. R. He developed and greatly increased the efficiency of this road. From this basis he rapidly gained control of other roads, by aid of a daring system of financing, using the credit of one road to raise funds to purchase a controlling influence in another. In this way he gained control of the Central and Southern Pacific railroads, the Oregon Railroad and Navigation Co., and made a vigorous effort to absorb the Northern Pacific. He was defeated in this by James J. Hill, the struggle leading to the stock exchange panic of 1901. A few years of this bold and discreditable system of speculation, in which he used the property of others for his own ends, raised him to the position of the railway autocrat of the United States. In 1906 the Interstate Commerce Commission instituted an investigation of his methods, which by the time had given him dominating control of a considerable number of roads, a large interest in others, and a similar interest in many financial institutions, and had brought him enormous wealth. The only public services rendered by him were a marked improvement in the condition of the roads under his control and a scientific expedition which he sent out in 1899 to explore the wastes of Alaska and the North Pacific. He died in 1909.

Harrington (har'ing-tun), James, a celebrated political writer, born in 1611; died in 1677. Having studied under Chillingworth at Oxford, and traveled on the continent, he was, on the outbreak of the Civil war, desirous of procuring a reconciliation between the king and Parliament, but his efforts were futile. During the Protectorate he wrote his *Oceana*, which describes an ideal republic, and which was published in 1656. In the reign of Charles II he was imprisoned on a charge of plotting against the government, but was released on account of the decay of his mental faculties. In addition to the *Oceana* he also published an English translation of four books of the *Æneid*.

Harrington, Mark Walrod, astronomer, born at Syracuse, Illinois, in 1848. He graduated at the University of Michigan in 1868, was professor of astronomy in that institution and director of its observatory 1879-91, and was chief of the Weather Bureau at Washington, 1891-95. He founded the *American Meteorological Journal* in 1884 and edited it until 1892. In 1895 he was appointed vice-president of the International Meteorological Conference at Munich.

Harris, Isham Green, legislator, born in Tullahoma, Tennessee, in 1818. He was a member of Congress in 1849-53, and governor of Ten-

nessee in 1857-63. During the latter part of the Civil war he served as a staff officer in the Confederate army. He subsequently practiced law in Memphis, and in 1877 was elected United States Senator, remaining in the Senate till his death in 1897. He was unanimously elected president pro tem. of the Senate in 1893.

Harris, Joel Chandler, story writer; born in Eatonton, Georgia, in 1848. He had a thorough familiarity with the negro of the post-bellum period, and while editing an Atlanta paper he produced for it the series of *Uncle Remus* sketches and songs which immediately made him known. Other works of negro lore in the same vein were *Nights With Uncle Remus, Mr. Rabbit at Home*, etc. As a journalist he was connected with the *Atlanta Constitutionalist.* He died in 1908.

Harris, Robert, a Canadian painter (1849-1919), born in Wales, removed to Prince Edward Island in childhood. He was director of the Montreal Art School, 1883-87, and president of the Royal Canadian Academy from 1893 to 1906. He produced many pictures of Canadian life, but was best known as a portrait painter.

Harris, Thomas Lake, an American spiritualist (1823-1906), born in England, settled in Utica, N. Y., in 1827. He founded a spiritualistic community in 1861 at Amenia, N. Y.

Harris, William Torrey, educator, born at North Killingly, Connecticut, in 1835; died in 1909. He studied at Yale, and was superintendent of the St. Louis public schools 1868-80. In 1867 he became editor of the *Journal of Speculative Philosophy.* In 1889 he was appointed United States Commissioner of Education. He published many articles on philosophy, art, and education, and was a member of the Concord Summer School of Philosophy, and an officer of the French Academy.

Harrisburg (har'is-burg), a city, capital of Pennsylvania and of Dauphin County, on the Susquehanna River, 105 miles W. of Philadelphia. Several bridges here cross the river, which is a mile wide and flows through picturesque scenery. The city has handsome buildings and public monuments, including the war monument, 110 feet high. The capitol building was burned in 1897, and has been replaced by a new capitol, one of the handsomest in the United States, and remarkable for its artistic decorations. The state library has 200,000 volumes. There are important industries, chiefly connected with iron and steel. Pop. (1920) 75,917.

Harrisburg, a city, capital of Saline County, Illinois, 68 miles N. E. of Cairo. It has flour, saw, and planing mills, brick and tile works. Coal is mined extensively. Pop. (1920) 7125.

Harrison (har'ris-un), Benjamin, United States President, grandson of President William Henry Harrison, was born at North Bend, Ohio, in 1833. He studied law and practiced in Indianapolis, his future home. He entered the Union army in 1862 as colonel, and served through the war, receiving the brevet rank of brigadier-general. In 1876 he ran for governor of Indiana, but was defeated, and in 1880 was a candidate for the United States Senate and was elected. In 1888 he was nominated by the Republican party for President, and was elected by a majority of 65 electoral votes. He ran again in 1892, but was defeated. He died in 1901.

Harrison, Frederick, author, born at London, England, in 1831. He graduated at Oxford in 1853, and came to the bar in 1858. In 1877 he was made professor of jurisprudence and international law under the Council of Legal Education. He gave much time and labor to the cause of education for working men and women. He published *Order and Progress, Social Statics, Annals of an Old Manor House, Early Victorian Literature, William the Silent*, etc.

Harrison, John, an English mechanician, born in Yorkshire in 1693 and died in 1776, was the son of a carpenter, and became an assistant to his father, who was occasionally employed in repairing clocks. An act of Parliament had been passed in 1714 offering rewards of £10,000, £15,000, or £20,000 for a method of ascertaining longitude within 60, 40, or 30 miles. This Harrison set himself to accomplish, but it was not till 1765 that he was fully successful, the highest award being then allotted him for the invention of his chronometer.

Harrison, Thomas Alexander, painter, was born at Philadelphia, Pennsylvania, in 1853. He became an artist, and produced many attractive landscapes, receiving for his *Le Crépuscule*, now in the Museum of Fine Arts, St. Louis, a prize of $2500. Other paintings are *In Arcady, Castles in Spain*, etc.

Harrison, William Henry, soldier and President, was born in Charles City County, Virginia, in 1773, the son of Benjamin Harrison, one of the signers of the Declaration of Independence and a member of the Constitutional

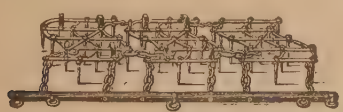
Convention of 1787. He entered the army in 1791 and served in the Indian wars of that period, becoming distinguished by his defeat of the Indian tribes at Tippecanoe in 1811. As major-general in the regular army he won an important victory over the British at the battle of the Thames in 1813. He was elected to Congress in 1817 and to the Senate in 1824, was minister to Colombia in 1828, and in 1836 was the Whig candidate for President of the United States, but was defeated by Van Buren. He was nominated again in 1840 and on this occasion was elected by a very large majority. He did not live long to enjoy the honor, dying on April 4, 1841, just one month after his inauguration.

Harrison, a city of Hudson Co., New Jersey, on Passaic River, opposite Newark. It has steel plant, wire factories, pump and tube mills, and numerous other industries. Pop. (1910) 14,498; (1920) 15,721.

Harrisonburg, a town, county seat of Rockingham Co., Virginia, in the Shenandoah Valley, with lumber, farming and dairy interests. Pop. (1920) 5875.

Harrogate (har'ō-gāt), a town of England, county of York (West Riding), noted for its magnesia, sulphur, and chalybeate springs. The bathing season lasts from May to September, and the number of annual visitors is about 40,000. Pop. (1911) 33,706.

Harrow (har'rō), an agricultural implement, employed for smoothing land which has been plowed. It consists of a frame of woodwork, or of iron, in which are fixed rows of iron teeth.



Set of Iron Harrows.

There are several varieties of this implement, such as the 'brake' for breaking down rough land; the 'drill harrow' for pulverizing land before the deposition of seed, the 'grubber' for pulverizing between furrows of green crops.

Harrow-on-the-Hill (or simply HARROW), a town of England, county of Middlesex, on a hill of peculiar form. The grammar-school of Harrow, the rival of Eton, was founded in 1571 for the education of the poor children of the parish, certain fees being charged for strangers; but it is now almost entirely a school for the wealthy. The education originally given was exclusively classical, but mathematics, science, English history and literature, music, and drawing are now included among the subjects taught. Pop. (1911) 17,076.

Harry the Minstrel (or HENRY) commonly called *Blind Harry*, a wandering Scottish poet of the fifteenth century, to whom is attributed a poetical narrative of the achievements of Sir William Wallace. Its date may probably be placed between 1470 and 1480. It professes to be based on a history written in Latin by John Blair and Thomas Gray, which is now lost. It is often inaccurate, and has ceased to be much read.

Hart, ALBERT BUSHNELL, was born at Clarksville, Mercer county, Pa., 1854, and after being graduated from Harvard (1880), studied at Paris, Berlin, and Freiburg. He was instructor in history at Harvard (1883–87), assistant professor (1887–97), and has been professor since 1897. His works include *Introduction to the Study of Federal Government* (1890); *Foundations of American Foreign Policy* (1901); and he has edited *American History Told by Contemporaries*, and other historical works.

Hart, SOLOMON, an eminent historical painter, born at Plymouth, England, in 1806; died in 1881. He was elected Royal Academician in 1840. His works include *The Elevation of the Law* (in the Jewish worship), *Milton Visiting Galileo in Prison, Richard and Saladin*, etc.

Hart, a stag of five years of age. See *Stag*.

Harte, FRANCIS BRET, novelist and poet, was born at Albany, New York, in 1839. He went to California in 1854, and figured as a coal-dealer, a teacher, and a typesetter on the *Golden Era*, in which appeared some of his earliest literary efforts. He next became editor of the *Californian*, and in 1864 secretary to the United States Mint at San Francisco. In 1868 he became editor of the *Overland Monthly*, in which appeared, in 1869, the humorous poem of *The Heathen Chinee*. In 1878 he was appointed consul at Crefeld, whence he was transferred to Glasgow in 1880, and remained there until 1885. Among his best-known works are *The Luck of Roaring Camp; The Outcasts of Poker Flat; The Argonauts of '49; Two Men of Sandy Bar; Gabriel Conroy; Mrs. Skagg's Husbands; East and West Poems; In the Carquinez Woods; Maruja, a Novel*, etc. He died in 1902.

Hartford Convention, a convocation composed of representatives from the New England States, met at Hartford, Connecticut, in 1814, 'to confer on the subject of their public grievances.' The war of 1812 had been destructive to industry and wealth. The convention aroused suspicion and drew on its members bitter but unjust denunciation.

Hartford (hart-fêrd), a city, the capital of Connecticut, on the Connecticut River, 60 miles above its mouth. It is pleasantly situated, is built with great regularity, and has among its edifices the state-house (built at a cost of $3,100,000), city hall, Hartford Theological Seminary, American School for the Deaf, Institute for the Blind, and Trinity College, St. Joseph's Cathedral, Wadsworth Athenæum, public libraries, the J. P. Morgan Memorial (in which many famous art treasures are kept). Both manufactures and trade are of large extent, the former embracing carpets, linen, silk, edge-tools, typewriters, electrical appliances, all kinds of machinery and machine tools, etc. Hartford is the seat of the Colt Firearms Company and a great center of the insurance business. Hartford was settled in 1635 by colonists from Massachusetts. The Hartford Convention (q. v.) met in the old State House (now City Hall). It was the home of many famous people. Pop. (1910) 98,915; (1920) 138,036.

Hartford, a city, capital of Blackford County, Indiana, 45 miles S. by W. of Fort Wayne. It has large glassworks, pulp mills, etc. Pop. 6187.

Hartington (hàr'ting-ton), SPENCER COMPTON CAVENDISH, MARQUIS OF, was born in 1833, son of the seventh duke of Devonshire. He was educated at Trinity College, Cambridge, and in 1857 was elected one of the members for North Lancashire. In 1863 he became war secretary; in 1868 postmaster-general; in 1871 chief secretary for Ireland. He went out with the Gladstone ministry in 1874, and soon after he became the leader of the Liberal party. On the fall of the Conservative government in 1880 he became secretary for India, and was transferred to the war office in 1882. In the general election in 1885 he was returned to parliament. He strenuously opposed Gladstone's Home Rule Scheme of 1886. He succeeded to the title of Duke of Devonshire on the death of his father in 1891, became lord president of the council in 1895, and died in 1908.

Hartlepool (härt'l-pöl), a borough of England, including the municipal borough of Hartlepool and the town of West Hartlepool, in the county of Durham, 17 miles S. E. of the city of that name. The trade and industries of the towns are much of the same character; they possess ironworks, engine and boiler works, shipyards, etc. The two towns may be said to form one port. Pop. of Hartlepool 20,618, of West Hartlepool 63,932.

Hartmann (härt'män), KARL ROBERT EDUARD VON, a German philosopher, born at Berlin, February 23, 1842; died near Berlin, June 5, 1906. With the publication of *Die Philosophie des Unbewussten* (Philosophy of the Unconscious), in which he substituted for Schopenhauer's world principle of will, the conception of the unconscious which contains within itself both will and intelligence, in 1869, he gained a conspicuous place among philosophic writers. Other of his works include *Phänomenologie des sittlichen Bewusstseins, Die Religion des Geistes, Die Weltanschauung der modernen Physik,* etc.

Hartmann von Aue (fon ou'e), a German poet, born about 1170; died about 1220. He wrote poetical tales, among which are *Erec, Iwein,* both belonging to the Arthurian cycle of legends, and *Der Arme Heinrich,* upon which Longfellow based his *Golden Legend.*

Hartranft, JOHN FREDERICK, soldier, born at New Hanover, Pennsylvania, in 1830; died in 1889. He studied law, entered the army in the Civil war and served till its close, gaining the rank of brevet major-general. He was chosen to execute the sentences of the military commission which tried Mrs. Surratt and others for the murder of President Lincoln. He was governor of Pennsylvania, 1872-78.

Hartshorn (hàrtz'hōrn), in pharmacy, the horn of the common stag, from which substances deemed of high medical value were formerly prepared by distillation, such as spirits of hartshorn, oil of hartshorn, and salt of hartshorn. The active ingredient of these was ammonia, which is now obtained from gas-liquor and other sources.

Hart's-tongue (*Scolopendrium*), a genus of highly ornamental ferns. Their fronds are simple and undivided. There are about a dozen species known, the *S. vulgāre* being found in England and the United States.

Hartz. See *Harz.*

Harun al Rashid (hȧ-rön' ȧl ra-shēd'), a celebrated caliph of the Saracens, 786-809.

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HARVARD UNIVERSITY—THE CAMPUS

(See *Caliph.*) The popular fame of this caliph is evinced by the *Arabian Nights' Entertainments*, in which Harun, his wife Zobeide, his vizier Giaffer, and his chief eunuch Mesrur are conspicuous characters.

Haruspices (har-us'pi-sēs). See *Aruspices.*

Harvard University (hȧr'vard), the oldest university in the United States, situated in Cambridge, Massachusetts. The nucleus of it was formed in 1636 by the voting of a sum of £400 by the general court of Massachusetts. In 1638 the Rev. John Harvard bequeathed half of his property and his entire library to the projected institution. The college was immediately opened and received the name of its benefactor. The first graduation occurred in 1642. Its endowments have greatly increased since that time, and its invested funds now amount to about $24,000,000. The principal college buildings number twenty-five, and include several halls, such as University Hall, Harvard Hall, etc. The general library contains upwards of 850,000 volumes. There are more than 600 instructors, exclusive of assistants, and the number of students is about 4000. An entrance examination is required in one of two sets of subjects, of which classics predominate in the one, mathematics and science in the other. After the first year's course, which embraces a prescribed series of studies, the student has a large number of different courses to select from in order to qualify for the degree of Bachelor of Arts. The course of study extends to four years. Among the departments connected with the university are: 1. The Law School; 2. The Lawrence Scientific School; 3. The Divinity School; 4. The Medical, and 5. The Dental School, both situated in Boston; 6. The Bussey Institution of Agriculture; 7. The School of Mining. There may also be mentioned the Museum of Comparative Zoology (the Agassiz Museum), the Botanical Garden, and the Peabody Museum of American Archæology and Ethnology; also the Radcliffe College for women, established in 1894, in which women students can attain the full collegiate degrees. In the engineering and mining schools instruction is given in coöperation with the Massachusetts Institute of Technology, now located in a group of magnificent buildings at Cambridge.

Harvest-bug (*Leptus autumnālis*), a small larval insect of the family Acaridæ or mites. It is of a bright red color, so small as scarcely to be visible, and resembles a grain of cayenne pepper. It appears in June or July, and attacks the skin of domestic animals and human beings.

Harvest-fly, a name given in the United States to a species of cicada, which appears as a winged insect in the harvest season.

Harvest-moon, a name which denotes a peculiarity in the apparent motion of the full moon, by which in the United States and high latitudes generally it rises about the same time in the harvest season (or about the autumnal equinox in September) for several successive evenings. In southern latitudes this phenomenon occurs in March. It is owing to the fact that the moon is then traveling in that part of her orbit at which it makes the least possible angle with the ecliptic.

Harvest-mouse (*Musmessorius*), the smallest British quadruped, first made known to science by White of Selborne. It builds a globular nest usually suspended among stalks of wheat, etc.

Harvest-spider (*Phalangium longipes*), the Shepherd-spider abounding in autumn, possessing legs of unusual length. When irritated it has the peculiar property of throwing off one or more of its legs.

Harvey, (hȧr'vi), Colonel George (1864-), an American editor and diplomat, born at Peacham, Vermont. He was editor and owner of the *North American Review*, and president of the publishing house of Harper & Brothers. In 1921 he was appointed ambassador to Great Britain by President Harding.

Harvey, Sir George (1806-76), an eminent Scottish painter. He was highly successful in depicting scenes connected with the religious history of Scotland, such as *The Covenanters Preaching, Quitting the Manse, Sabbath in the Glen, Communion of the Covenanters*, etc.

Harvey, William, an English physician, the discoverer of the true theory of the circulation of the blood, was born at Folkestone in 1578; died in 1657. He entered Caius College, Cambridge, in 1593, and about 1599 proceeded to Padua, then the most celebrated school of medicine in Europe, and attended lectures on anatomy, surgery, and other branches of medical science. He took the degree of M. D., and returned to England in 1602. He settled in London, was admitted fellow of the College of Physicians, elected physician of St. Bartholomew's Hospital, and in 1615 was chosen Lumleian lecturer. His views on

the circulation of the blood were formally given to the world in his *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* ('On the Movement of the Heart and Blood in Animals'), published at Amsterdam in 1628, in which he claims to have expounded and demonstrated them for upwards of nine years. Harvey's theory was attacked by several foreign physicians; but from the commencement his views were widely received. In 1623

Harveyized Steel, a term applied to armor-plate steel which has been surface hardened by a process invented by H. A. Harvey. In this process an all-steel plate is laid in a bed of finely powdered clay or sand, and the upper surface covered with carbonaceous material, which is pressed down upon it. Over the carbon is placed a layer of sand covered in with fire brick. Heat is then applied of a sufficient intensity to melt iron. The heat and pressure are kept up for several days until the face of the steel has absorbed enough carbon to harden it. An additional amount is usually about one per cent. The carbonaceous material is then removed and the plate chilled in running water.

Harwich (hăr'ich), a seaport of England, County Essex, 66 m. E. N. E. of London. The harbor is spacious, and has been much improved by the construction of two breakwaters. Steam packets ply regularly to continental ports. Ship-building and other maritime employments are carried on, and cement is dredged up outside the harbor. Harwich is much frequented by sea-bathers. Pop. (1911) 13,623.

Harwood, Andrew Allen (1802-1884), an American naval officer, born at Settle, Pa. During the Civil War he was chief of the Bureau of Ordnance, commanded the Potomac flotilla and was secretary of the Lighthouse Board. He was promoted to rear admiral in 1869.

Harz, or Hartz (hărts), the *Hercynia Silva* of the Romans, the most northerly mountain chain of Germany, from which an extensive plain stretches to the North Sea and the Baltic. It extends from southeast to northwest, and comprises an extent of about 60 miles in length and nearly 20 in breadth, embracing the towns of Klausthal, Goslar, Blankenburg, Wernigerode, etc. The Brocken, its highest summit, is 3742 feet high. (See *Brocken.*) That part of the Harz which includes the Brocken, with the neighboring high summits, is called the Upper Harz, and consists entirely of granite. The southeast portion is called the Lower Harz. The Harz abounds in woods and fine pastures; and is rich in minerals, including silver, iron, lead, copper, zinc, arsenic, manganese, granite, porphyry, slate, marble, alabaster, etc.

Harvey, a city of Cook county, Illinois, a suburb of Chicago. It has manufactures of machinery, stoves, railroad supplies, etc. Pop. 9216.

Hasdrubal (has'dru-bal; more correctly *Asdrubal*, 'Baal is his help'), the name of several Carthaginian leaders, particularly the brother of Hannibal, the hero of the Second Punic war. On the departure of Hannibal for Italy, B.C. 218, he was left in command of the army in Spain, in which capacity he carried on a long series of military operations against the Roman troops, which were commanded by Cnæus and Publius Scipio. His brother Hannibal requiring his assistance in Italy, Hasdrubal led an army from Spain into that country (B.C. 207), but before he could join forces with his brother he was defeated on the right bank of the Metaurus by C. Nero and M. Livius. Nero is said to have thrown Hasdrubal's head into Hannibal's camp, as a brutal announcement to him of the defeat and death of his brother.

Hashish (hash'ēsh), an intoxicating preparation made in Eastern countries from common hemp (*Cannăbis sativa*), or rather from the Indian variety of it (*Cannabis Indica*); also a name for this plant itself or for its tender shoots. The juice of the plant has powerful narcotic properties, and is variously made use of. A resin which the plant gives out is often gathered and kneaded and formed into small balls called *churrus*, and from this a narcotic is prepared. It has the appearance of a tenacious ointment of a greenish-yellow color, with an acrid savor and a nauseous smell. Hashish produces a kind of intoxication, accompanied with ecstasies and hallucinations. When dried and smoked as tobacco the plant is called *bhang;* or this name is given to a drink prepared from the leaves and shoots. *Ganja* or *Gunja* is the dried shoots of the female plant with the resin on them. Hashish in several forms is employed in medicine.

Haslingden, a town of Lancashire, England, 16 miles N. of Manchester. It has textile interests and iron works. Pop. 18,723.

Hasselt (häs'selt), capital of Limburg, Belgium. Tobacco, lace, and linen are produced. Pop. 16,804.

Hastings (hās'tings), a city, county seat of Barry Co., Michigan, on Thornapple River, 32 miles S. E. of Grand Rapids. It has manufactures of felt boots, wood products, etc. Pop. 5132.

Hastings, a city, county seat of Adams Co., Nebraska, 96 miles' W. of Lincoln. Seat of Hastings College (Presbyterian) and a Catholic academy. Its manufactures include cigars, land rollers, candy, flour, harness, pumps, brick and tile, brooms, clothing, etc. It is the center of a grain and stock-raising region; is an important shipping point, and has large cold-storage plants. Pop. (1910) 9338; (1920) 11,647.

Hastings, HASTINGS-UPON-HUDSON, a village of Westchester Co., New York, above Yonkers. It is a residential place; has chemical works and other industries. Pop. (1920) 5526.

Hastings (hās'tingz), a town of England, county of Sussex, one of the Cinque Ports, pleasantly situated on the seacoast, and including the suburb of St. Leonards-on-Sea. In front of the town is an esplanade, a fine pier 900 feet long, and baths said to contain the largest tepid swimming-bath in the world. William of Normandy defeated Harold near here, 14th October, 1066. Pop. 61,014.

Hastings, FRANCIS RAWDON, MARQUIS OF, Governor-general of India, born in 1754; died in 1825. He entered the army and from 1776 to 1782 served with distinction in the American war. In 1793 he became Earl of Moira, and in 1795 commanded the expedition to Quiberon. From 1813 to 1823 he was governor-general of India, and was successful in the Nepaulese and Mahratta wars. In his later years he was governor of Malta.

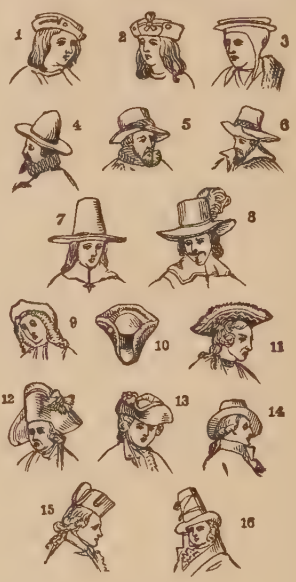
Hastings, THOMAS, American architect, born in New York 1860, was educated in Paris and graduated from the Ecole des Beaux-Arts in that city in 1884. He entered partnership with John M. Carrere and remained in the firm of Carrere and Hastings, from 1884 designers of many notable buildings in the United States. The firm were architects of the Ponce de Leon and Alcazar hotels at St. Augustine, Fla., the New York Public Library, the Central Congregational Church at Providence, R. I., the New Theatre, later the Century, New York; the Senate Office at Washington, D. C. Thomas Hastings was elected a member of the National Academy in 1909 and became a Chevalier of the Legion of Honor, France.

Hastings, THOMAS (1787-1872), an American hymn-writer and choir leader. His hymnals include *The Christian Psalmist, The Mother's Hymn-Book, Devotional Hymns and Poets,* etc.

Hastings, WARREN, first governor-general of India, was born at Daylesford, in Worcestershire, in 1732; and died there in 1818. He was grandson of the rector of Daylesford. He was educated at Westminster School, and in 1750 he set out for Bengal in the capacity of a writer in the service of the East India Company. When stationed at Cossimbazar he was taken prisoner by Surajah Dowlah on the capture of the place (1756). Having made his escape, he served as a volunteer under Clive in 1757. He was representative of the Company at Moorshedabad from 1758 to 1761. In the latter year he removed to Calcutta, having obtained a seat in the Bengal Council, but returned to England in 1764. As he lost the bulk of his means by unfortunate Indian investments, he again entered the Company's service, and sailed for India in 1769. In consequence of the misgovernment of the Nabob of Bengal the Company had deprived him of all real power, and now wished to have the country more directly under their control. Warren Hastings was its chief instrument in this undertaking, and in 1772 became president of the Supreme Council of Calcutta. Mohammed Reza Khan, the administrator of the revenues of Bengal, was now accused by an unprincipled character named Nuncomar of corruption and abuses of power. In this prosecution Hastings acted as the tool of the Company. Mohammed and Shitab Roy, dewan of Behar (who had been similarly accused), were afterwards honorably acquitted, but meantime the reorganization desired by the Company had been carried out. In 1773 the Company's powers were considerably modified by an act of Parliament, and Hastings now received the title of Governor-general of India. As the majority of the Council disapproved of Hastings' past policy, Nuncomar, his old ally, took advantage of the circumstance to accuse him of peculation (1776). The accusations were favorably received by the Council, when Nuncomar was suddenly accused by a Calcutta merchant (acting probably on the instigation of Hastings) of forgery, tried, and executed. In 1776 the directors of the Company petitioned the government for his removal from the Council,

but Hastings resigned, and a successor to him was appointed. In 1777 one of the members of the Council died, and Hastings, having thus procured a casting vote, withdrew his resignation, and returned to office. He now displayed extraordinary resource in meeting dangerous movements on the part of the Mahrattas, the Nizam of the Deccan, and Hyder Ali of Mysore, and to procure the needful money was less than scrupulous in his treatment of the rulers of Benares and Oude. He thus gave good grounds for censure, and a motion for his recall was passed in the House of Commons. Fox's India Bill was thrown out in 1783, but next year Pitt's bill, establishing the board of control, passed, and Hastings resigned. He left India in 1785, and was impeached by Burke in 1786, being charged with acts of injustice and oppression, with maladministration, receiving of bribes, etc. This celebrated trial, in which Burke, Fox, and Sheridan thundered against him, began in 1788, and terminated in 1795 with his acquittal, but cost him his fortune. The Company in 1796 settled on him an annuity of £4000 a year, and lent him £50,000 for eighteen years free of interest. He passed the remainder of his life in retirement at Daylesford, which he purchased.

Hat, an outdoor covering for the head, of various shapes and materials (as felt, silk, wool, straw), but having a *brim* as its most distinctive and general feature. Hats are of ancient origin. Among the Greeks, for instance, the *petasos* was worn, which had a brim, and was similar to the round felt now worn. The shape of the hat has varied extremely in Europe at different periods. The *dress hat* or *silk hat* with a smooth nap outside is an important form of this article, though felt hats are in more general wear. (See *Felt.*) The silk hat was invented at Florence about 1760. The manufacture, however, did not make much progress till 1828. Up to and even after this time beaver fur was the chief material for hats. A silk hat is composed of a skeleton, to which the silk plush is glued. The skeleton, consisting of three parts, the cylindrical part or body, the crown, and the brim, is usually made of linen, covered with gum-lac, and to the cylindrical part the crown is gummed. The cylindrical part is made by gumming together the edges of a piece of cloth shaped on a cylinder. The brim is composed of superposed layers of stiffer cloth, and made with a flat projecting surface round its inner edge, which is gummed to the skeleton. For covering the hat a sort of hood of silk plush is made, cut across in an oblique line. This cover is drawn over the skeleton on the block, and fitted exactly to it by the application of a hot iron. The heat of the iron melts the gum-lac, which on cooling cements the covering to the skeleton. The edges



Forms of Hats in 16th, 17th, and 18th Centuries.

1, 2, time of Henry VIII. 3, time of Mary. 4, time of Elizabeth. 5, 6, time of James and Charles I. 7, 8, time of Commonwealth. 9, 10, time of William III. 11-16, Eighteenth Century.

of the oblique cut are also coated with gum-lac. The hat is finally shaped on the block or form, and the plush damped and polished, while the hat revolves on a turning lathe. In the manufacture of straw hats the straw commonly used is that of wheat or barley. The best comes from Italy, and particularly from Tuscany, but straw hats are also largely made in England. Palm-leaf hats are imported from China and Manila, and are also machine-made in the United States.

Hatching, natural and artificial. See *Incubation.*

Hatchment (hatch'ment; corrupted from *achievement*), in heraldry, the coat of arms of a person dead, usually placed on the front of a house, in a church, or on a hearse at funerals, by which the fact of the death and the rank of the deceased may be

known; the whole being distinguished in such a manner as to indicate whether the person was a bachelor, married, etc.

Hatchway (hatch'wā), a square or oblong opening in the deck of a ship, affording a passage from one deck to another, or into the hold. The *after-hatchway* is placed near the stern, the *fore-hatchway* towards the bows, and the *main-hatchway* near the mainmast.

Hathaway, ANNE, wife of Shakespeare, born in 1556; died in 1623.

Hatfield (hat'fēld), a town of England, in Hertfordshire, 19 miles N. N. W. of London. Pop. 8592.

Hathor. See *Athor.*

Hatras (hä'trus), a town of India, Northwest Provinces, Aligarh District, formerly one of the strongest fortresses in India, now a commercial center. Pop. 42,578.

Hatteras, CAPE, at the extremity of a low sandbank, North Carolina, with lighthouse 190 ft. high. It is separated from the mainland by Pimlico Sound.

Hattiesburg, county seat of Forrest Co., Mississippi, on Leaf River, 116 miles N. E. of New Orleans. Seat of Mississippi Normal and Baptist Woman's colleges. Center of yellow-pine industry. Has box factories, lumber and planing mills, house factories naval stores, etc. Pop. (1920) 13,270.

Hatto (hat'to), the name of two archbishops of Mainz, of which the second, who died in 969 or 970, is the best known. He was Abbot of Fulda, 942–968, when he was appointed Archbishop of Mainz. Of his subsequent life very opposite accounts exist: some represent him as an upright prelate and reformer of abuses; others in the blackest colors. The legend of his being devoured by rats, which Southey has popularized, is well known.

Hatton (hat'on), SIR CHRISTOPHER, Lord-chancellor of England, a favorite of Queen Elizabeth, born about 1540; died in 1591. He was one of the commissioners for the trial of Mary, queen of Scots, in 1586.

Hatzfeld (hàts'felt), a town of the Austrian Empire, in Hungary, district of Torontal. Pop. 10,152.

Hauberk (hạ'bėrk), a kind of coat of mail, comprising the small and the large hauberk, the former consisting of a jacket in scales descending to the hips, with loose sleeves not reaching to the elbow; the latter with a *camail* or hood, reached to the knee, the sleeves extending a little below the elbow.

Hauff (houf), WILHELM, a German novelist and writer of humorous and fantastic stories, born 1802; died 1827. His first publication was his *Almanach of Tales* for the year 1826. *Lichtenstein,* a novel written under the inspiration of Sir Walter Scott, appeared in 1826, and is one of the best German novels of its class. Among the most popular of his works are two novelettes, *The Picture of the Emperor* and *The Beggarwoman of the Pont-des-Arts.*

Haupt (houpt), LEWIS MUHLENBERG, engineer, was born at Gettysburg, Pennsylvania, in 1844. He graduated at West Point, entered the engineer corps of the army, but resigned in 1869 and became professor of civil engineering in the University of Pennsylvania. After 1892 he served in the Nicaragua and Panama Canal Commissions, was chief engineer of the survey for a ship canal across New Jersey, and served in other enterprises. He wrote *Working Drawings, The Topographer, A Move for Better Roads,* etc.

Haupt, PAUL, orientalist, was born at Görlitz, Germany, in 1858. In 1883 he became professor of Semitic languages in Johns Hopkins University. His works include *The Cuneiform Account of the Deluge, The Akkadean Language, Jonah's Whale, The Book of Esther,* etc., and editor of *The Polychrome Bible,* and *New Critical Edition of Hebrew Text of the Old Testament.*

Hauptmann (houpt'-män), GERHART, a German poet, dramatist and novelist, was born in Silesia in 1862 and received the Nobel prize for his novel, *Atlantis,* on his fiftieth birthday. Among his best-known plays are *Vor Sonnenaufgang* (*Before Sunrise*), 1889; *Die Weber* (*The Weavers*), 1892; *Die Versunkene Glocke* (*The Sunken Bell*), 1896; *Rose Bernd,* 1903.

Hauran (hä-ö-rän'), a district in Syria, east of the Jordan and south of Damascus. It contains the ruins of many ancient towns, with numerous Greek inscriptions. In the Roman period it was one of the four provinces of Bashan. It is a very fertile territory, but thinly populated at the present time.

Haussa (hous'sa). See *Houssa.*

Haustellata (hạs-tel-la'ta), a very extensive division of insects, in which the mouth is furnished with a haustellum or proboscis adapted for suction. It includes the butterflies and moths, two-winged flies, etc., these insects being contrasted with the Mandi-

bulata, which have jaws acting as cutting organs.

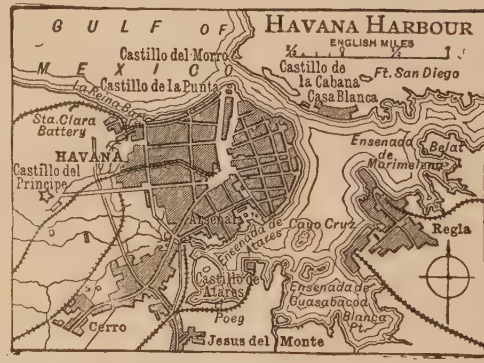
Hautboy (ō'boi). See *Oboe.*

Hautelisse Tapestry (ōt'lis), a kind of tapestry wrought with a perpendicular warp, as distinguished from *Basselisse.*

Hautes-Alpes. See *Alpes.*

Hautes-Pyrénées. See *Pyrénées.*

Haüy (à-ü-ē), René Just, a French mineralogist, born in 1743; died in 1822. He studied theology, became an abbé, and during twenty-one years occupied the place of a professor, at first in the college of Navarre, and afterwards in that of the Cardinal Le Moine. He studied botany, and subsequently mineralogy, and introduced a once celebrated system of crystallography. On the outbreak of the revolution Haüy was imprisoned for refusing to subscribe to the new constitution, but his life was saved by the exertions of Geoffroi de St. Hilaire. In 1793 he was appointed a member of the Commission of Measures and Weights, in 1794 conservator of the Cabinet des Mines, and in 1795 teacher of physics in the Ecole Normale. In 1802 Napoleon made him professor of mineralogy in the Musée d'Histoire Naturelle, and also shortly after in the Faculté des Sciences. Haüy was remarkable for the extreme modesty of his disposition. His principal writings are his *Essai sur la Théorie et la Structure des Cristaux* (1784), his *Traité de Minéralogie* (1802), his *Traité élémentaire de Physique* (1803), and his *Traité de Cristallographie* (second edition, 1822), etc.—His brother Valentin, born 1745, died 1822, started the first institution for the instruction of the blind. See *Blind (The).*



Havana (ha-van'a; Spanish, *La Habana,* 'the haven'), an important maritime city, capital of Cuba, on the northwest side of the island, with an extensive and excellent natural harbor. The town in the older parts has narrow, badly-paved streets, but there are also wide and handsome promenades and avenues. The houses, which are low and with flat roofs, resemble those of Southern Spain. Havana is the see of a bishop, and was the seat of the governor. The cathedral formerly contained the ashes of Columbus, which were brought hither from San Domingo in 1796. Among the other buildings are the governor's house, the admiralty, the university, the exchange, the opera house, etc. The staple manufacture is that of its celebrated cigars. The other manufactures, consisting chiefly of chocolate, straw hats, and woolen fabrics, are not of much consequence. The trade is extensive, the most important articles of export being sugar and tobacco, unmanufactured or in the form of cigars and cigarettes; other exports are molasses, coffee, wax, honey, rum. The United States have the principal share of the trade, and Spain and England rank next. The town was founded in 1511, but was only fairly begun in 1519. In 1762 it was taken by the British, who restored it to Spain in the following year. It was blockaded by the American fleet during the war with Spain. January 1, 1899, the United States military authorities took formal possession of the city, and relinquished it in 1902. Pop. (1913) 324,200.

Havel (hä'vel), a navigable river of Germany, which rises in Mecklenburg-Schwerin, enters Prussia, flows past Spandau, where it receives the Spree, and joins the Elbe, after a course of 160 miles.

Havelberg (hä'vel-burg), a town in Prussia, province of Brandenburg, on the Havel, engaged in brewing, sugar-refining, and shipbuilding. Pop. 6649.

Havelock (hav'lok), Sir Henry, major-general in the British army, was born at Bishop-Wearmouth, near Sunderland, in 1795. Having entered the army, he served with distinction in the Burmese war (1824-26). In 1829 he married a daughter of Marshman, the celebrated missionary, became a Baptist, and

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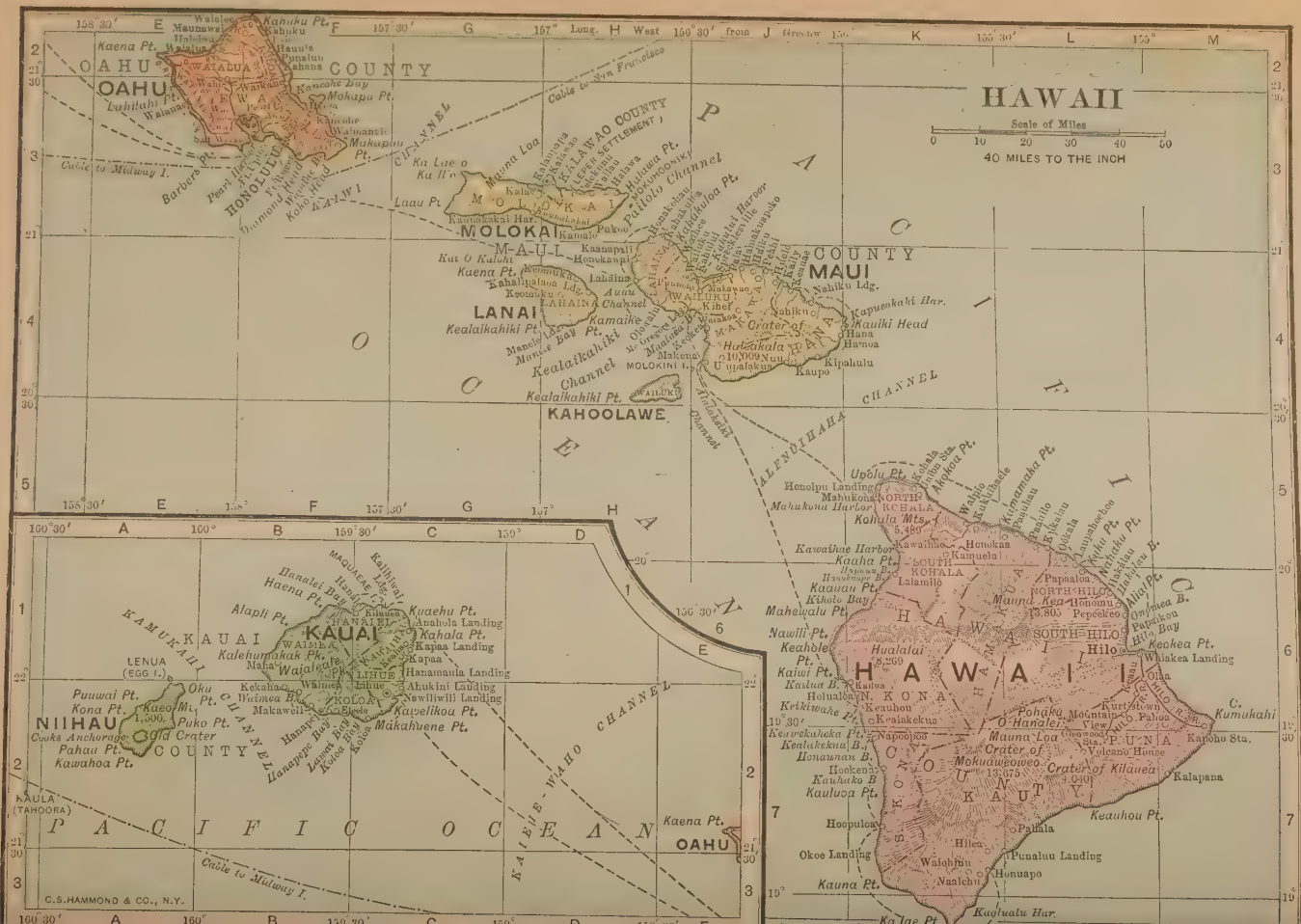
HAVANA, CUBA

A bird's-eye view of the city, showing the Prado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SOUTH KOHALA
KAIWI CHANNEL
KALOHI CHANNEL
PAILOLO CHANNEL
ALENUIHAHA CHANNEL
KAIEIE-WAHO CHANNEL
PACIFIC OCEAN
Cable to Midway I.
Cable to San Francisco
Mauna Loa
Crater of Kilauea
Mokuaweoweo Crater
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Kauluoa Pt.
Kaena Pt.
Barbers Pt.
Pearl Harbor
Honolulu
Diamond Head
Waianae
Waialua
Kahuku Pt.
Kaena Pt.
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Laau Pt.
Kalaupapa
Kalawao
Kalaupapa Settlement
Kaunakakai Har.
Kaunakakai
Pukoo
Halawa
Halawa Pt.
Pukoo
Kaanapali
Honokawai
Lahaina
Lahaina Roads
Kamaiki
Kealaikahiki Pt.
Manele Bay Pt.
Manele Bay
Kealaikahiki Channel
Kaupo
Kipahulu
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was distinguished during the remainder of his life by his earnest religious zeal. He attained his captaincy in 1838, participated in the Afghan war, was present at the storming of Ghazni and the capture of Cabul, and in Sale's march to Jelalabad, and assisted in the defense of that city, and in the defeat of Mohammed Akbar, 1843. He was made a Companion of the Bath, and brevet-major, took part in the Mahratta war, and distinguished himself in the Sikh war of 1845. In 1851 he was promoted to the adjutant-generalship of the queen's forces in India. On the outbreak of the Indian mutiny he was despatched to Allahabad to support Sir H. Lawrence at Lucknow and Sir H. Wheeler at Cawnpore. After several victories he arrived at Cawnpore and found that Nana Sahib had massacred the prisoners. Pursuing his march to Lucknow, he defeated the Rebels at Bithoor, and finally, with the aid of Outram won the battle of Alumbagh. Having captured Lucknow, Havelock and Outram were shut up there until relieved by Sir Colin Campbell, 17th November, 1857. He died just seven days later. He was raised to the rank of major-general and made a baronet.

Haven (hā'ven), JOSEPH (1816-74), an American theologian, born at Dennis, Massachusetts, educated at Amherst College, and studied for the ministry at Union Theological Seminary, New York. He was pastor of Congregational churches at Ashland and Brookline, Massachusetts, for a time, and later became professor of systematic theology at Chicago Theological Seminary, 1858-70.

Haverfield (hāv'er-feld), FRANCIS (1860-), an English educator and historian, born at Shipston-on-Stour, educated at New College, Oxford. He was Rhind lecturer at Edinburgh, 1905-06; Creighton lecturer at London University, 1910; a governor of Westminster school, 1900-08; first president of the Society for the Promotion of Roman studies, 1910-16. His publications include *The Romanization of Roman Britain*, *Ancient Town-Planning*, etc.

Haverford (hāv-er-ford), a township of Montgomery Co., Pennsylvania. Seat of Haverford College (q. v.). Pop. (1920) 6631.

Haverford College, an educational institution at Haverford, Pa., founded by the Friends in 1833; chartered as a college in 1856.

Haverfordwest (hāv'ėr-fōrd, hār'fōrd), a town of Wales, county town of Pembroke, and one of the Pembroke district of parliamentary boroughs, on the West Cleddaw River. It manufactures paper, and has a small shipping trade. Pop. (1911) 5920.

Havergal, FRANCIS RIDLEY, a popular hymn writer, was born at Astley, Worcestershire, England, 1836; died, 1879. Her writings in poetry and prose have been extremely popular with the religious public and some of her hymns have found their way into church collections. Her collected *Poetical Works* appeared in 1884.

Haverhill (hā'vėr-il), a city of Essex County, Massachusetts, on the Merrimac, 33 miles N. of Boston. It has extensive manufactures of boots and shoes, employing nearly 20,000 hands, and also produces box boards, hats, caps, flannels, and bricks. The river is navigable to this town. The poet Whittier was born here in 1807. Pop. (1910) 44,115; (1920) 53,884.

Haverstraw (hav'er-stra), a village of Rockland Co., New York, 35 miles N. of New York City. It has extensive manufactures of bricks and brick machines, and has dyeworks and print mills. Pop. (1920) 5226.

Havildar (hāv-il-dar'), the highest non-commissioned officer in the native armies of India, in rank equivalent to a sergeant. Also a police official in villages.

Havre (ä-vr), LE (formerly *Le Havre-de-Grâce*), a seaport of Northern France, dep. Seine-Inférieure, on the north side of the estuary of the Seine, 108 miles northwest of Paris, built of brick or stone in straight, wide streets. The public buildings possess little interest. The manufactures include chemicals, machinery, cotton goods, earthen and stone ware, paper, glass, oil, refined sugar, ropes, etc. A government tobacco factory employs 300 workmen; and a great number of vessels are built. But the chief dependence of Havre is on its commerce, which is the greatest of any French port next to Marseilles. It was the temporary capital of Belgium, 1914-18, during the European war (q. v.). Pop. 136,159.

Havre, a city, county seat of Hill Co., Montana, on the Milk River, 105 miles N. E. of Great Falls. Railroad shops of the Great Northern R. R. are here. Pop. (1920) 5429.

Hawaii (hä-wī'ē), or HAWAIIAN ISLANDS, formerly the SANDWICH ISLANDS, a cluster of islands in the North Pacific, thirteen in number, with a total area estimated at 6000 to 7000 square miles. Five of these islands are barren islets, and only four are of considerable size. They are generally of volcanic origin and mountainous in charac-

ter, with numerous lofty peaks. The highest of these, Mauna Kea, on the island of Hawaii, is 13,805 feet high, and Mauna Loa (an active volcano on the same island) is 13,675 feet. On the eastern slope of the latter is the famous volcano Kilauea, 4400 feet in elevation, but with an enormous crater and a living lake of fire, which at times overflows in tremendous eruptions. Haleakala on Maui Island, is 10,030 feet high and has a crater 2000 to 3000 feet deep and from 25 to 30 miles in diameter. It is, however, inactive. The surface of the islands in general is rugged, though with many fertile valleys; the coasts high and precipitous, with few good harbors. Of the habitable islands, Hawaii (which now gives its name to the group) is much the largest, its area being 4015 square miles. The second largest, Maui, of 728 square miles area, consists of two peninsulas, connected by a low isthmus. The most important island is Oahu, of only 600 square miles in area, yet the most populous and containing the city of Honolulu, the capital and chief port of the island group. Next in size is Kauai, of 544 square miles. The remaining habitable islands are much smaller, Molokai, of 261 square miles, being peopled by a colony of lepers, sent there from the other islands. The native Hawaiians are of the light-colored oceanic Malay stock, and have become civilized and converted to Christianity. There are extensive forests, and fruits grow profusely, including banana, mango, guava, plantain, and others. Coffee is a semi-wild plant, and taso yields an important food product. Of cultivated plants, the sugar cane is by far the most important, the great bulk of the population being engaged in its culture, and Hawaii ranking third in cane sugar production. Coffee and rice are also raised, the chief exports being sugar, rice, coffee, bananas, tallow, and hides. The natives of the islands have greatly decreased in numbers, being now much surpassed by the introduced population, consisting of Japanese, Chinese, Portuguese, and comparatively few other Europeans and Americans. Honolulu has grown into a city of considerable importance, having a splendid harbor, and concentrating nearly the whole trade of the islands.

These islands were discovered by Captain Cook in 1778, the discoverer losing his life here. Each island had formerly its own king, but under Kamehameha I (who died in 1819) they were combined into one kingdom. It was a simple despotism until 1840, when Kamehameha III granted a constitutional government. At a later date Queen Liluokalani sought to restore the despotism and in 1893 a revolution broke out, headed by American settlers, and the queen was deposed and a provisional government formed under the presidency of Sanford B. Dole. It was made a republic in the following year. The islands were offered to the United States, but not accepted until August, 1898, when the warship *Philadelphia* was sent to take possession. In June, 1900, the group was organized under a territorial government, and given the title of Hawaii Territory. Pop. (1920) 255,912.

Hawarden (hȧr'den), a town in Flintshire, Wales, lying in a coal district, and having valuable clay beds in the vicinity. In the neighborhood is Hawarden Castle, residence of the late William E. Gladstone. Pop. 20,575.

Hawes (hauz), STEPHEN, an English poet, who lived in the end of the fifteenth and beginning of the sixteenth century. The exact date of his birth and death is unknown. His principal work is *The Historie of Graunde Amour and la Bell Purcell, or The Pastime of Pleasure.*

Hawfinch (hȧ'finch; *Cocothraustes vulgāris*), a species of grossbeak, so called from the belief that it subsisted principally on the fruit of the hawthorn. It is one of the largest of the finches. It resembles the chaffinch in color, but is distinguished from it by its enormous beak, larger size, and bill-hook formation of some of its wing-feathers. Among American species of grossbeak are evening grossbeak and pine grossbeak.

Hawick (hȧ'ik), a parliamentary burgh of Scotland, in Roxburghshire, on the Teviot, 50 miles S. W. from Edinburgh. The staple industries of the town are the manufacture of hosiery and tweeds, but tanning, skin-dressing, oil-making, dyeing, and iron-founding are also carried on. Pop. 17,303.

Hawk (hȧk), a name often applied to all birds of prey except the eagles, vultures, and owls. It thus includes the falcons as well as the hawks proper, the latter being distinguished from the former chiefly by their shorter wings, which do not reach the extremity of the tail, and have the fourth quill longest and the first short; their beaks also are less robust, and want the tooth-like notch of the former. None is bolder and more pertinacious in pursuit of its prey than the sparrow-hawk (which see); see also *Falcon.*

Hawke (hȧk), EDWARD, LORD, a celebrated English naval commander, born in 1705; died in 1781. He entered the navy as a midshipman, in 1734 received the command of the *Wolf*, and

in 1747 became commander of a squadron, and defeated the French fleet at Belleisle. Hawke was in consequence made a K. C. B., and vice-admiral of the blue. In 1759 he defeated the French at Quiberon. Hawke was, in 1765, appointed vice-admiral of Britain, and was elevated to the peerage in 1776.

Hawker (hąk'er), ROBERT STEPHEN, an English poet and divine, was born in 1805, and died in 1875. He was educated at Oxford and became vicar of Morwenstow, Cornwall. His works comprise *Ecclesia, Cornish Ballads; Echoes from Old Cornwall; The Quest of the Sangreal*; etc.

Hawkers and Peddlers, traveling vendors of small wares.

Hawke's Bay, a district of New Zealand, on the east coast of North Island; area, 3,050,000 acres, containing much fertile soil, well adapted for agricultural and pastoral purposes. The capital is Napier. Pop. 8775.

Hawkesbury, a river in New South Wales, flowing into the Pacific near Sydney, and remarkable for its inundations.

Hawking. See *Falconry.*

Hawkins (hąk'inz), SIR ANTHONY HOPE, author, widely known as 'Anthony Hope,' was born in London, 1864, studied law, but gave up his practice in 1894 and wrote many novels. He was knighted in 1918. Author of *Man of Mark, Mr. Witt's Widow, Dolly Dialogues, Prisoner of Zenda, The Indiscretion of the Duchess, The Heart of ... Princess Osra, Phroso*, etc.

Hawkins, SIR JOHN, an English sea commander, born at Plymouth, in 1520. He made several voyages in his youth in the slave trade and was defeated by the Spaniards in 1567. He was appointed vice-admiral and knighted for his services against the Spanish Armada, and in 1595 sailed, in company with Drake, against the Spanish colonies in the West Indies, but was unsuccessful. He died the same year.

Hawk-moth, one of the sphinx moths, so called from its hovering motion, which resembles that of a hawk looking for its prey. The death's-head hawk-moth is the *Acherontia atropos*; the privet hawk-moth, the *Sphinx ligustri*; the humming-bird hawk-moth, the *Macroglossa stellatarum.*

Privet Hawk-moth.

Hawkweed, or *Hieracium*, a genus of composite plants, characterized by yellow, orange or red flowers, with imbricated involucre, furrowed and toothed fruit, and bristly pappus. In America, the native species of *Hieracium* are generally known as rattlesnake-weeds, but *H. aurantiacum*, which is supposed to be naturalized from Europe, is known as the orange hawkweed.

Hawley (hą'lē), JOSEPH ROSWELL, statesman, was born at Stewartsville, North Carolina, in 1826. He studied law, and became prominent as a Republican writer and speaker. He served during the Civil war, and was mustered out as brevet major-general. In 1866 he was chosen governor of Connecticut, and in 1868 president of the Republican National Convention meeting at Chicago; was member of Congress, 1872-76, and in 1873-76 president of the United States Centennial Commission, in which he was largely instrumental in furthering the international exhibition at Philadelphia. In 1881-1905 he was United States senator. Died in 1905.

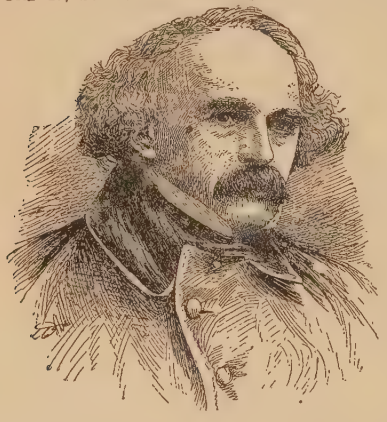
Hawser (hą'sėr), in ships, a small cable or a large rope, in size between a cable and a tow-line, used in warping, etc.

Hawthorn (hą'thorn), or WHITETHORN (*Cratægus Oxyacantha*), a small spiny European tree, belonging to the sub-order Pomeæ of the order Rosaceæ, rising sometimes to the height of 20 to 25 feet. The leaves are alternate, obovate, 3 to 5 lobed; the flowers are white, sometimes with a reddish tinge, disposed in corymbs, and possess an agreeable perfume; the fruit is a drupe of a red color, and is edible. The species are about fifty in number, all shrubs or small trees. A number of them belong to the United States. When young the hawthorn springs up rapidly, and if pruned grows into a thick hedge. Hawthorn blossom is often called *May*, from the time of its flowering in England. The double-flowered kind is attractive.

Hawthorne, a borough of Passaic Co., New Jersey, adjoining Paterson. It has glass and dye works, candy factories, railroad shops and other industries. Pop. (1920) 5135.

Hawthorne, NATHANIEL, a novelist of remarkable originality, born at Salem, Massachusetts, in 1804; died in 1864. He studied at Bowdoin College, where he took his degree in 1825 along with the poet Longfellow. For a number of years after this he led a retired and studious life in Salem, writing tales, some of which appeared in newspapers and magazines. In 1837 appeared

his *Twice-told Tales*, a collection of stories which he had contributed to various American periodicals. In 1838 he was appointed a weigher in the Boston custom-house, a post which he held for a few years. In 1846 he published his *Mosses from an Old Manse;* in 1850 *The Scarlet Letter;* in 1851 *The House of the Seven Gables;* and in 1852 *The Life of President Pierce,* and the *Blithedale Romance.* In 1853 he became American consul at Liverpool, a post which he held until 1857. He died at Plymouth, New Hampshire. Other works are his *Transformation* (1860), *Our Old Home* (1863), etc.— JULIAN, son of the above, born in 1846;



Nathaniel Hawthorne

also a novelist. He wrote *Bressant, Idolatry The Subterranean Brotherhood,* etc.

Hay (hā), the stems and leaves of grasses and other plants cut for fodder, dried in the sun, and stored usually in stacks. The time more suitable for mowing grass intended for hay is that in which the saccharine matter is most abundant in the plants, viz. when the grass is in full flower. For the operation of mowing, dry weather, and, if possible, that in which sunshine prevails, is chosen. The making of the grass into hay generally takes three or four days to get it ready for stacking. This period is principally occupied in alternately *tedding* (*i. e.* shaking out the grass loosely) and gathering it up into cocks or small heaps, previous to stacking. Care must be taken to avoid haymaking either under a scorching sun or during the prevalence of rain, and the cocks should never be opened in the morning until the disappearance of the dew. In stacking the great object is to preserve the freshness of the herbage, and to induce a slight degree of fermentation. If the weather has been wet a few layers of straw may be inserted at intervals. Salting is also recommended. On large farms the tedding is performed by a tedding or haymaking machine.

Hay, JOHN, American statesman and author, born at Salem, Indiana, October 8, 1838; died at Newburgh, New Hampshire, July 1, 1905. He graduated from Brown University in 1858, studied law in the office of Abraham Lincoln, was admitted to the bar in 1861, and soon after became Lincoln's private secretary, serving until his death. He was secretary of the U. S. Legation at Paris, 1865–67, at Vienna, 1867–69, and at Madrid, 1869–70. After his return he was for five years an editorial writer on the New York *Tribune;* and 1879–81 first assistant secretary of state. In 1897 Hay was appointed by President McKinley ambassador to Great Britain, but was recalled in 1898 to become secretary of state, succeeding W. R. Day, who was sent to Paris as a member of the Peace Conference. This office he held until his death. He directed the peace negotiations with Spain after the war of 1898, influenced the Powers to declare publicly for the 'open door' in China, urged the 'administrative entity' of China, and took the initiative in inducing Russia and Japan to 'localize and limit' the area of hostilities. With Lord Pauncefote he secured the abrogation of the Clayton-Bulwer Treaty and the conclusion of a new treaty with Great Britain (1901), by which Great Britain withdrew her objections to a canal constructed by the United States across the Isthmus of Panama, under the guarantee of neutralization by the latter Power. He also negotiated treaties with Colombia and with Panama, looking toward the conclusion of the canal; arranged the settlement with Germany regarding Samoa, and that by just commission concerning the disputed Alaska boundary in 1903. He published *Pike County Ballads* (1871), *The Breadwinners* (1883), etc., and with John G. Nicolay *Abraham Lincoln: A History* (10 vols. 1894).

Hayden, FERDINAND VANDEVEER, an American geologist, born in Westfield, Mass., 1829; graduated at Oberlin in 1850; engaged in the Civil War as surgeon of volunteers, and was brevetted lieutenant-colonel; spent many years in exploring the Rocky Mountains and adjacent country. He edited the first eight reports (1867–1876) of the United States geographical and geological surveys and wrote several works on exploration in the West. He died in 1887

Haydn (hī'dn), JOSEPH, a celebrated Austrian musical composer, born at Rohrau, on the borders of Hungary and Austria, 1732; died 1809. At the age of six he was sent to school at Haimburg, where he learned, among other things, singing and playing by rote. On account of the excellence of his voice he was appointed a choir-boy at St. Stephen's Church, Vienna. At the age of sixteen his voice began to break, and he lost his situation as chorister. Having made the acquaintance of Metastasio, Porpora, and Gluck, Hadyn gradually attracted attention by the brilliancy of his compositions; the *Creation* being his masterpiece.

Haydon (hā'dun), BENJAMIN ROBERT, an English historical painter, born in 1786; died by his own hand in 1846. In 1804 he became a student of the Royal Academy, and in 1807 exhibited his first work, *Joseph and Mary Reposing* (in Egypt), and his *Dentatus* in 1809. His *Judgment of Solomon* appeared in 1814. In 1815 he established a school in opposition to the Academy, an undertaking which ended in pecuniary failure in 1823. He was the chief English historical painter of his time.

Hayes, CHARLES WILLARD, Dr. C. Willard Hayes, for many years Chief Geologist of the United States Geological Survey, died in Washington, D. C., February 10, 1916. He was born in 1859.

Hayes, (hāz), ISAAC ISRAEL, Arctic explorer, born in Chester County, Pennsylvania, in 1832; died in 1881. He was a member of the expedition of 1853–55 under Dr. Kane, and himself commanded an expedition in 1860–61. He served as an army doctor during the war, and in 1869 he visited Greenland. He wrote *The Open Polar Sea*, and *The Hand of Desolation*.

Hayes (hāz), RUTHERFORD BIRCHARD, President, was born at Delaware, Ohio, in 1822. He was a successful practitioner of the law until in 1861, at the outbreak of the Civil war, he was made major of volunteers. His conduct on the field was marked by conspicuous gallantry, and he attained by meritorious service the rank of brevet major-general. In 1865 he was elected a member of Congress, where he won the reputation of a good working member. In 1867, 1869, and 1875 he was elected governor of Ohio. In 1876 he was nominated for the Presidency against Samuel J. Tilden, the Democratic candidate. The election proved so close that the result was in doubt, both parties claiming a victory. An Electoral Commission, appointed by Congress, was required to decide the result of the election, which declared in favor of Mr. Hayes. His administration was conciliatory towards the South, and earnest in its efforts for the reform of the civil service. After his retirement he was actively interested in education and prison reform. He died in 1893.

Hay Fever, or HAY ASTHMA, a complaint characterized by the symptoms of common catarrh; swelling of the nasal mucous membrane, copious watery discharge and paroxysms of sneezing. The exciting cause is attributed to various substances, such as pollen of certain flowers, dust, etc.

Haymarket Square Riot, an occurrence at Chicago on May 4, 1886, when a bomb was thrown by some unidentified person during an anarchist meeting on Randolph Street. Seven policemen, who had been endeavoring to disperse the mob, were killed, and 27 others wounded. The bomb thrower was never arrested, but four men were hanged as accomplices and several others were imprisoned.

Haynau (hī'nou), JULIUS JAKOB, an Austrian general, born in 1786; died in 1853. He took part in the battles of Austerlitz and Wagram.

Hayne (hān), ISAAC, a Revolutionary martyr, born in South Carolina in 1745. Taken prisoner at the capture of Charleston, he was paroled to visit his sick family. Required to join the British, he fled to the American camp, and was made colonel, but was soon captured and hanged.

Hayne, PAUL HAMILTON, American poet, born at Charleston, S. C., 1830. Called the Laureate of the South; died 1886.

Hayne, ROBERT YOUNG, American statesman, born 1791. He served in the war against England in 1812, and in 1823 became United States Senator from South Carolina. He opposed Daniel Webster in debate over Foote's resolution. Died 1839.

Hay-Pauncefote Treaty. See *Hay*.

Hayti (hā'ti), HAITI, or SAN DOMINGO (originally *Española;* Latin, *Hispaniola*), one of the West Indies, southeast from Cuba, and separated from it by the Windward Passage, 50 miles broad. Its length is 400, and breadth 150 miles; area, about 28,000 square miles. It is of irregular form, intersected west to east by three chains of mountains. The central chain contains the highest peak, Loma Tina, 10,200 feet. The principal plain is the fertile Vega Real. The rivers are numerous, but of small size. The minerals include gold, silver.

quicksilver, etc., but are greatly neglected. Hayti as a whole is one of the healthiest of the West Indian Islands. The seasons are: a wet, during which heavy rains are most frequent in May and June; and a dry, during which little or no rain falls. The flora includes pines, mahogany trees, fustic, satin-wood, lignum vitæ, and other cabinet and dye woods, plantains, bananas, yams, batatas, oranges, pineapples, etc. The staple cultivated products are: coffee, sugar, indigo, cotton, tobacco, and cacao. The fauna includes the agouti, European cattle and pigs run wild, snakes, caymans, turtles, etc. Among the principal towns in Hayti are Port-au-Prince, San Domingo, Jacmel, and Cape Haytien.

Hayti was discovered by Columbus in 1492. It was then inhabited by perhaps 2,000,000 natives, but so ruthlessly did the Spaniards deal with the aborigines that within a century they practically exterminated them, having introduced negro slaves in their place. In 1630 the French settled in the western part of the island, and in 1697 the western portion was ceded to them, while the eastern remained Spanish. In 1791 the negroes revolted against France, and latterly the whole island came under the negro leader Toussaint L'Ouverture, who established an independent republic. He was captured, but in 1803 Dessalines headed a new insurrection, drove out the French, and was crowned emperor of Hayti. He was assassinated in 1806, and the Spaniards regained the eastern portion of the island. In 1821 the Spanish portion declared itself independent of the mother country, and assumed the name of Spanish Hayti; but it was subjugated by Boyer, the President of the Haytian Republic, or French Hayti. In 1844 the inhabitants of the Spanish portion rose, and formed themselves into a republic under the name of San Domingo (Reoublica Dominica). In 1861 Santana negotiated a reunion of the state with Spain, but Spain evacuated the island in 1865. From that period its history presents a long record of revolution and bloodshed, of which the gunpowder explosion that killed President Leconte in 1912, is typical. It now comprises the Republic of Hayti on the west side of the island, and the Dominican Republic on the east. Port au Prince is the capital of Hayti, which has an area of 10,204 sq. miles and population of 2,000,000. San Domingo is the capital of the Dominican Republic, which has 18,045 sq. miles area and about 700,000 population. The people are in great part negroes and mulattoes. A murderous outbreak in 1915 led to a ten days' reign of terror and United States intervention, that country taking control of the custom house and finances for ten years, and establishing a native constabulary force under the command of an American officer.

Hazard (haz'ard), a game at dice played for money. The player is called the *caster*, and his opponent, who bets with him, is called the *setter*. The former calls a *main, i. e.* any number from 5 to 9 inclusive. He then throws with two dice, and wins if he 'nicks.' Five is a nick to 5; 6 and 12 are nicks to 6; 7 and 11 to 7, etc. The caster loses or 'throws out' if he throws aces, or deuce ace (called *crabs*). Hazard is a game involving nice calculations.

Hazaribagh (ha-zär-i-bäg'), chief town of the district of the same name, in Chota Nagpur, Bengal. Pop. 15,306. The district contains 7021 square miles. Pop. 1,104,742.

Hazebrouck (äz-bruk), a town of France, dep. Nord, having a fine church with an open spire 240 feet high. It has linen manufactures, breweries, tanneries, dye-works, etc. Pop. 9194.

Hazel (hā'zel; *Corylus*), a genus of shrubs or small trees of the order Corylaceæ or Cupuliferæ. It belongs to Europe, North Africa, Asia, and North America. The leaves are roundish-cordate, alternate, and shortly petiolate. The European hazel (*C. Avellāna*) produces the nuts called filberts, and grows best in a tolerably dry soil. It bears male and female flowers, the former composing cylindrical catkins. The hazel-nut oil is little inferior in flavor to that of almonds. Hazel branches form excellent walking-sticks, fishing-rods, etc., and the wood produces good charcoal, often employed by painters. The American hazel (*C. americāna*) very much resembles the European. The roots are used by cabinet-makers for veneering; and in Italy the chips are sometimes put into turbid wine for the purpose of fining it.

Hazel-grouse (*Bonāsa betulīna*), a species of grouse inhabiting the continent of Europe and great part of Asia, allied to the ruffed grouse of America.

Hazeline (hā'zel-ēn), an alcoholic liquid distilled from the fresh leaves of the *Hamamēlis Virginica*, the witch-hazel, native to the United States. It is exceedingly useful as an application to wounds, stanching the bleeding and promoting healing. It is equally useful for bruises, inflammatory swellings, sprains, and the like. It is applied on a pledget of lint to bleeding piles. In internal bleeding, whether from the lungs, stomach, or bowels, it gives very satisfac-

tory results. There are several officinal preparations of the witch-hazel, a fluid extract and a tincture, the dose of the former being 15 to 60 drops, and of the latter 2 to 5. Hazeline is the name given to a clear colorless liquid prepared by certain chemists, but not officinal.

Hazleton (hāz'el-ton), a city of Luzerne County, Pennsylvania, 22 miles S. of Wilkes-Barre, on the Lehigh Valley and Pennsylvania railroads. It is in the anthracite coal region, surrounded by colleries and other industries affiliated with mining. It has iron, steel and pump works; also numerous textile establishments, such as silk, knitting, underwear and shirt factories. An excellent State hospital is located here. It was settled in 1820, incorporated as a borough in 1856; became a city in 1892. Pop. (1910) 25,452; (1920) 32,277.

Hazlitt (haz'lit), WILLIAM, English critic and essayist, son of a Unitarian minister, was born at Maidstone in 1778; died in 1830. In 1793 he became a student in the Unitarian College, Hackney, but on leaving it devoted his time to portrait painting. This was in its turn renounced for literature, his first publication being an essay *On the Principles of Human Action*, 1805. He delivered various series of lectures, and contributed to the *Edinburgh Review*, etc. Among his chief works are: *Characters of Shakespeare's Plays*, *A View of the English Stage*, *Lectures on the English poets*, *Lectures on the English Comic Writers*, *Table Talk*, *Lectures on the Elizabethan Age*, *Life of Napoleon Bonaparte*, and *Round Table* essays, written with Leigh Hunt.—WILLIAM CAREW, born in 1834, grandson of the above, became an author and editor, among his publications being *History of the Venetian Republic*, *Memoirs of William Hazlitt*, etc.

Head (hed), the term applied to the anterior part of the body of an animal when marked off by a difference in size, or by a constriction (neck). A gradual increase of complexity in the structure of the head is observable as we ascend from the lowest to the highest forms of life. In the Protozoa, Infusoria, and Cœlenterates nothing that can be regarded as a head is found, and it is not till we ascend to the worms proper, the articulated animals (crustaceans, myriapods, spiders, and insects), the land and freshwater gasteropods (snails and whelks), and the cuttle-fishes, that a head proper is found. The cuttle-fishes have a remarkable cartilaginous box, which, like a skull, protects their anterior nervous ganglia, and gives support to the muscles. The head of the vertebrated animals presents a regular series of increasing complexity from the lancelet upwards, and as the anterior nervous mass enlarges, and its ganglia increase in complexity, so do the anterior vertebræ change their character; as the brain becomes specialized, so does the brain-case or skull, attaining its highest development in man. In man, and in the higher vertebrates, the head consists of an upper chamber, lodging the brain, the eyes, and other sense organs, and a lower, lodging the first portion of the alimentary canal. In proportion as the vertebrates become developed, the brain increases in size, and its position advances anteriorly, until, in man, it comes to overhang the face. The head is the seat of intelligence and of consciousness, as it contains the brain and the organs of sense, touch being the only sense not limited to it. See *Skull*.

Head, SIR FRANCIS BOND, miscellaneous writer, brother of the following, born 1793; died 1875. He was present at the battle of Waterloo, being in the royal engineers; in 1825 undertook the working of gold and silver mines in Rio de la Plata; in 1835 became governor of Upper Canada, and in 1838 suppressed the Canadian insurrection, and was made a baronet. He was the author of *Bubbles from the Brunnen of Nassau*, *Rough Notes of Rapid Journeys across the Pampas*, *A Faggot of French Sticks*, *The Horse and his Rider*, etc.

Head, SIR GEORGE, a writer of travels, etc., born in 1782; died in 1855. He held various posts in the army, and was present at most of the great battles of the Peninsula. In 1814 he proceeded to Canada to be chief of the commissariat of a proposed navy on the Canadian lakes, and subsequently published his experiences in *Forest Scenes and Incidents in the Wilds of North America*. He was knighted in 1831. He also wrote *Rome, A Tour of Many Days*, translations of Pacca's *Memoirs*, and of Apuleius, with other works.

Headache (*Cephalalgia*), arises from a variety of causes. The principal forms it assumes are:—(1) *Congestive Headache*, arising from overfulness of blood. It may be cured by purgatives, while reduction of the diet and saline medicines are beneficial. (2) *Anæmic Headache*, which arises from a deficiency of blood, and occurs in persons badly fed or in weak girls. Good food and iron tonic, with application of cold to the head, are often of service in such cases. (3) *Nervous Headache*, which often attacks the studious, and which is relieved by nerve tonics, and especially by phosphorus pills. (4) *Neuralgic Head*

ache, which is often due to exposure to cold. What is called *Hemicrania* or *Megrim*, which is the limitation of the headache to one-half or less of the head, is often treated with bromide of potassium. In cases in which headache arises from disease of the liver, nausea results, and this characterizes *bilious* headache. Impurity of blood and gouty affections, as well as disease of the kidneys, are frequent sources of headache.

Head Hunters, a title given to several tribes, including the Dyaks of Borneo, the Kyans of Celebes, the natives of Formosa, etc., on account of their savage mania of hunting for human heads, chiefly by nocturnal raids, and treasuring them as trophies. The practice resembles the scalp-taking of the American Indians.

Headley, Joel Tyler, historian, was born in Delaware county, New York, in 1814; was graduated at Union College in 1839. In 1855 he was elected secretary of state for New York. He was the author of numerous works of history and biography, including *Napoleon and his Marshals* (1846), *Oliver Cromwell* (1848), *The Second War Between England and the United States* (1853), *Life of Washington* (1854), and *The Great Rebellion* (1863-66). He died in 1897.—His brother, Phineas Camp (1819-1901), a Presbyterian minister, wrote *Women of the Bible*, *Public Men of To-day*, Lives of Josephine, Kossuth, Grant, etc., and many other works.

Healds. See *Heddles.*

Health (helth) is that condition of the living body in which all the bodily functions are performed easily and perfectly, and unattended with pain. The most perfect state of health is generally connected with a certain condition of the bodily organs, and well marked by certain external signs. See *Sanitary Science.*

Health, Bill of. See *Bill.*

Health, Municipal Boards of, in the United States, are institutions organized under city government, and deriving powers from state laws for the purpose of protecting the health of the citizens. Every city of importance has a municipal board of health.—State Boards of, institutions established by state legislative enactments, intended to have a central advisory relation with local sanitary organizations, and to superintend a state system of vital statistics. They have been created in most of the states, and in the District of Columbia, with ever-widening activities.

Hearing. See *Ear* and *Acoustics.*

Hearn, Lafcadio, author, born in the Ionian Islands in 1850, resided for many years in New Orleans and New York, and later in Japan. His *Two Years in the French West Indies* is an example of poetical prose that attracted much attention. He wrote also *Glimpses of Unfamiliar Japan*, and other works. He died in 1904.

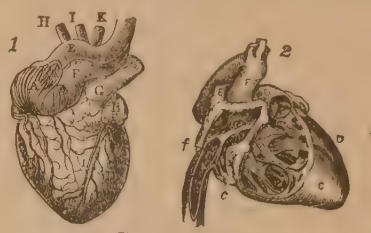
Hearne (hêrn), Thomas, an English antiquary, born in 1678; died in 1735. Hearne studied at Oxford, and was in 1701 appointed assistant keeper of the Bodleian Library, and he held the post of second librarian from 1712 to 1715, but had to resign as his Jacobite principles precluded him from taking the oaths to the government. Among his works may be mentioned *Ductor Historicus*, *Reliquiæ Bodleianæ*, *History and Antiquities of Glastonbury*, editions of Leland, of Spelman's *Life of Alfred*, Fordun's *Scotichronicon*, etc.

Hearst, Phebe, philanthropist, born in 1842, her maiden name being Apperson. In 1861, she was married to George F. Hearst, late United States Senator from California, who died in 1891. He left her very wealthy, and she donated from $3,000,000 to $4,000,000 to the University of California for buildings, having previously paid the cost of a competition of the best architects of Europe and America for the plans. She also gave $200,000 to the American University, Washington, D. C., to build a National Cathedral School for girls, and considerable sums for other educational and charitable work.

Hearst, William Randolph, son of the preceding, born in San Francisco, California, in 1863. He became a journalist in early life, and was editor and proprietor of the *San Francisco Examiner* in 1886. In 1895 he bought the *New York Journal*, and later bought the *Advertiser* and renamed it the *American*, and started the *Chicago American* and *Morning Examiner*, the *Boston American*, and the *Los Angeles Examiner.* He engaged actively in politics, made himself prominent by his radical newspaper methods, was elected to Congress in 1903 and 1905, and was a candidate for the Democratic Presidential nomination in 1904. He ran for mayor of New York City in 1905, for governor of New York State in 1906, and for mayor again in 1909.

Heart (hart), a hollow muscular organ, the function of which is to maintain the circulation of the blood, the organs of circulation being the heart

the arteries, the veins, and the capillary vessels. The heart in men, quadrupeds, birds, and some reptiles is composed of four cavities, two *auricles* and two *ventricles*. It is enveloped in a membrane called the *pericardium*, and is situated toward the left of the cavity of the chest, between the lungs. With each beat the apex of the heart strikes against the wall of the chest in the space between the fifth and sixth ribs, a little below and to the right of the left nipple. The right auricle communicates with the right ventricle, besides which there are in it three openings, that of the *vena cava inferior*, that of the *vena cava superior*, and that of the *coronary vein*. The communication between this auricle and ventricle is closed by a valve when the ventricle contracts. The right ventricle communicates with the pulmonary artery, the opening into the artery being guarded by a valve formed of three flaps. When these are brought together they interrupt the communication between the ventricle and the artery. The left auricle communicates through a valved opening with the left ventricle, and contains the orifices of the four pulmonary veins. The left ventricle, besides the communication with the left auricle, contains the orifice of the aorta, also provided with a valve similar to that of the pulmonary artery. The auricle and ventricle of one side are separated from those of the other by a complete muscular partition, the *septum cordis*. The valves at the openings of the arteries are called *semilunar*, that at the orifice of the right auricle *tricuspid*, that at the orifice of the left auricle *mitral*, and that at the orifice of the vena cava inferior the *Eustachian* valve. The heart is formed of a firm thick muscular tissue, composed of fibers interlacing so as to form a figure of eight. It also contains nerves and vessels. The arteries carry the blood from the heart to all parts of the body. They terminate in the capillary vessels, a series of extremely minute tubes which pass over into the veins. The veins are the channels by which the blood passes back from the body to the right auricle of the heart. The blood which is returned from the veins is purplish red, from excess of carbonic acid gas and deficiency in oxygen, and is called *venous;* that which leaves the heart is bright red, being oxygenated, and is called *arterial*. The venous blood parts with its excess of carbonic acid and receives new supplies of oxygen in the capillary system of the lungs, flows into the pulmonary veins, thence into the left cavities of the heart, thence it passes into the aorta, and is transmitted to all parts of the body, returning to the veins by the capillary system. It is now become venous, passes through the veins from the extremities towards the heart, receiving the chyle and the lymph, and is emptied into the right cavities of that organ, which returns it through the pulmonary artery to the capillary vessels of the lungs, where it is subjected to the influence of the air, resumes the qualities of red or arterial blood, and is ready for a new course.



HUMAN HEART.

Fig. 1, Exterior. A, Right auricle. B, Left auricle. C, Right ventricle. D, Left ventricle E, Vena cava superior. F, Aorta. G, Pulmonary artery. H, Brachiocephalic trunk. I, Left primitive carotid artery. K, Left subclavian artery. L, Left coronary artery.

Fig. 2, Section, right side. C, D, E, F, G as in Fig. 1. *a*, Cavity of right auricle. *b*, Inferior vena cava. *c*, Coronary valve. *d*, Entrance of the auriculo-ventricular opening. *e*, Valve of the pulmonary artery. *f*, Fossa ovalis.

The mechanism of the circulation is as follows:—The blood contained in the two venæ cavæ is poured into the right auricle, which contracts, and thus forces the fluid to escape; but the venæ cavæ oppose to its backward passage the column of blood which they contain, and it must therefore pass into the right ventricle. The ventricle then contracts, and the tricuspid valve closing the passage through which the liquid entered, it is forced into the pulmonary artery, along which it must flow (return to the ventricle being prevented by the semilunar valve) into the capillary system of the lungs, whence it passes into the pulmonary veins, which pour it into the left auricle by four orifices. The contraction of the auricle impels it into the left ventricle, by which it is driven forward into the aorta (the mitral valve preventing its return into the auricle), and thence into the general circulation. The two auricles contract and relax simultaneously with each other, as do also the two ventricles. The relaxation is called *diastole;* the contraction *systole*. The quantity of blood projected at each systole is generally estimated at six ounces. The causes of the alternate contraction and relaxation are

entirely involuntary and dependent on the nervous system to a large extent. The systole of the ventricles is the cause of the motion of the blood in the arteries, which dilate with each wave driven into them.

The heart is the seat of various and generally dangerous diseases. One of these is *pericarditis* or inflammation of the pericardium, the double lining membrane or bag enveloping the heart. The cause of this disease may be exposure to cold, or an injury, or it may be complicated with other diseases. Inflammation of the inner lining is termed *endocarditis*. *Valvular* disease is a common affection of the heart, the valves becoming thickened, contracted, rigid, or otherwise affected, so that they cannot properly perform their duty. The mitral valve, for instance, may become too narrow and contracted, and the result is that all the blood does not pass into the aorta. In other cases of valvular disease, the same result follows, viz. imperfect depletion of the ventricles and auricles, the return of blood being termed *regurgitation*. The heart consequently becomes weakened, while the entire system suffers. *Overgrowth* or *hypertrophy* and *dilatation* are frequent results of valvular disease. In such cases the avoidance of violent exercises and emotions is necessary. The use of *digitalis* is often successful in strengthening and soothing the heart. Certain diseases produce atrophy, in which the heart becomes feeble in action, while *fatty degeneration* occurs when the muscular fibers are replaced by oleaginous particles. This renders the heart peculiarly liable to rupture under any strain or violent emotion, hence such should be carefully avoided by patients. Among other organic diseases of the heart are *angina pectoris* (the cause of which is uncertain), distinguished by a sense of strangling or suffocation in the breast. *Neuralgia* of the heart is similar in symptoms to angina. A very common heart ailment is *palpitation*, often caused by indigestion, and the excessive use of tea and tobacco. *Syncope* or *fainting* results from the sudden cessation or slowing of the heart's action, and may be caused by excitement, emotion, or shock of some kind. Some of the above forms of heart disease can be discovered only by auscultation or percussion; others are very evident even to non-professional observers.

Heart's-ease. See *Violet.*

Heart-urchin, the name applied to certain genera of sea-urchins on account of their cordate or heart shape.

Heat (hēt), the name given to a peculiar sensation, and also to the agent which produces it, this being now believed to be a certain motion in the minute molecules of which all bodies are composed.

One of the most obvious effects of heat is to alter the *temperature* of bodies. In almost all cases when heat is supplied to a body, the temperature of the body rises, and when heat is removed the temperature of the body falls. If the increase of temperature is evident, and such as may be noted by the thermometer, the heat is then termed *sensible;* if not, as in the case of ice immediately melted, it is termed *latent.* Temperature is, in fact, the tendency that a body has to impart heat to other bodies. If two bodies impart no heat to each other when in contact, they are said to have the same temperature. When the one possesses more heat than the other there is an impartation of heat from the former until the temperature is equalized. Different bodies require very different amounts of heat in order to raise their temperature through the same number of degrees. Thus it requires about thirty times as much heat to raise the temperature of 1 lb. of water 1° as to raise the temperature of 1 lb. of mercury by the same amount. The terms *capacity for heat* and *specific heat* are used in relation to this property of bodies. The capacity for heat of a body is the quantity of heat required to raise its temperature 1° from some fixed point, as from 0° C., or from 32° Fah. The specific heat of a substance is the ratio between the quantity of heat required to raise the temperature of the substance 1° from some fixed point and the quantity of heat required to raise the temperature of an equal mass of distilled water 1° from 0° C.

Heat changes the *dimensions* of bodies. Increase of volume is the normal effect, although the reverse is observed in water between 0° C. and 4° C., and in iron and bismuth. Between moderate limits bodies expand nearly regularly with the temperature, but this does not hold good of the more extreme limits. (See *Expansion.*) Addition of heat *liquefies solid bodies*, and converts *liquids into gases.* During the conversion of a solid into a liquid, or a liquid into a gas, a considerable quantity of heat is absorbed, and in the reverse process heat is given out; but this is one of the cases in which, though heat is taken in or given out, the temperature is not altered. Hence the heat is said to be made *latent.* Heat also alters the power of bodies for *conducting electricity.* In solids the conductivity is diminished

to a great extent by an increase of a few degrees in the temperature. In liquids, on the other hand, increase of temperature increases the conductivity. The magnetic properties of bodies are also changed by heat. For example, an iron bar that has been magnetized suddenly loses the whole of its magnetism at a particular temperature. Heat possesses the power of altering the *chemical properties* of bodies. In some cases it breaks up chemical compounds, but in general it favors chemical combination.

In measuring quantities of heat various units may be adopted, as, for instance, the quantity necessary to melt a pound of ice. But the unit quantity of heat now generally fixed on (the Centigrade thermometer and metrical system being employed) is the quantity of heat which will raise the temperature of 1 gramme of distilled water from 0° C. to 1° C.; or 1 lb. of water may be used instead of 1 gramme, and one degree Fahrenheit instead of one degree Centigrade. *Calorimetry* is the technical name given to the part of the subject that deals with the practical measurement of quantities of heat.

When heat is applied to one end of a bar of iron it is propagated through the substance of the bar, producing a rise of temperature which is first perceptible at near, and afterwards at remote portions. This transmission of heat is called *conductivity*. The best *conductors* are metals, but all bodies conduct more or less. The best conductor is silver, next follow in order of their conductivity copper, gold, brass, zinc, tin, steel, iron, lead. With the exception of mercury and other melted metals, liquids are exceedingly bad conductors of heat. This can be shown by heating the upper part of a column of liquid and observing the variations of temperature below. These will be found to be scarcely perceptible and to be very slowly produced. If the heat were applied below we should have the process called the *convection of heat;* the lower layers of liquid would rise to the surface, and be replaced by others which would rise in their turn, thus producing a circulation and a general heating of the liquid. When the heat is applied above the expanded layers remain in their place, and the rest of the liquid can be heated by conduction and radiation only.

Radiation of heat consists in the propagation of heat from a hotter body to a colder one through an intervening medium which is not heated during the process. The heat is transmitted by the same medium that transmits light from a luminous body. Radiant heat and light are, in fact, the same thing, namely, vibrations of an elastic medium, the luminiferous ether, supposed to fill all space, and they obey the same laws of reflection, refraction, interference, and polarization. They also obey the general laws of wave-motion. A luminous body excites in the ether waves or undulations of a great many different wave-lengths, some of them capable of affecting the eye as light, and others not. Heat rays need not be at all luminous; they may have no light-giving power, but may be what are known as rays of *dark heat*, capable of being detected by the thermometer, but not perceptible to the eye. Other rays are purely *chemical* in their effect (as in photography), and are called *actinic* rays. The general effect of radiation is to equalize the temperature of any system of bodies so placed as to be capable of radiating one to the other. Every body of the system is constantly sending forth heat rays in all directions, and receiving the heat radiated from the other bodies. But the hotter bodies emit more than they receive, while the colder bodies receive more than they emit, and the temperature of the system is thus gradually equalized. The rapidity or otherwise of radiation differs much in different bodies. The radiation depends on the nature of the surface of the body, and the power of a body to radiate heat is intimately connected with its power of absorbing heat radiated to it, and with its power of reflecting heat. Surfaces that are good radiators are good absorbers, and surfaces that absorb heat readily reflect it badly. Thus, a kettle covered with soot loses, when filled with hot water, heat more rapidly than one with a brightly polished surface. The best absorber of all is a surface covered with a thin coating of lampblack. Brightly polished metals are the worst absorbers among the bodies that are not transparent to radiant heat.

The transmission of radiant heat through various substances is a subject of great importance. In this connection the terms *diathermanous* and *athermanous* correspond to *transparent* and *opaque* in the case of light. One of the chief diathermanous bodies is rock-salt. Common white glass transmits rays of high refrangibility, stopping those of low refrangibility. Hence its use as a fire screen. For the greater part of the heat of a common fire is of the dark kind, and is nearly all stopped by the glass; but glass does not screen from the heat of the sun, a great part of which consists of heat of high refrangibility. On the other hand, smoked rock-salt transmits very little of the heat of high refrangibility, though it

is almost perfectly diathermanous to dark heat.

The nature of heat was long a subject of active controversy. The common theory during the last century, and in the early part of the present, was the *materialistic*, or that by which heat was regarded as an imponderable fluid (*caloric*) which could permeate all matter, and which, uniting with the particles of bodies, produced the phenomena associated with heat. The materialistic theory was held by Black and Lavoisier, but it was exploded by the experiments of Rumford and Davy. Among the contributions of Davy to the science was his celebrated experiment of rubbing together two pieces of ice, while surrounded by an ice-cold atmosphere, until they melted away completely. He concluded that 'the immediate cause of the phenomenon of heat is motion, and the laws of its communication are precisely the same as the laws of the communication of motion.' Between 1840 and 1843 Joule conclusively established the truth of this theory —the *dynamical theory* of heat—by measuring the amount of energy required to produce a definite heating effect, and by showing that the quantity of heat obtained by expending a definite amount of energy in friction is the same whatever is the nature of the body in which the friction takes place. The conclusions arrived at by him are thus given:—

1st. The quantity of heat produced by the friction of bodies, whether solid or liquid, is always proportional to the quantity of work expended.

2d. The quantity of heat capable of increasing the temperature of 1 lb. of water by 1° Fah. requires for its evolution the expenditure of mechanical energy represented by the fall of 772 lbs. through 1 foot. This amount of energy or work, equal to 772 *foot-pounds*, is called the *dynamical equivalent of heat*.

That heat is a form of energy is now considered by all to be beyond question. Every substance is considered to have some kind of molecular structure, and heat is regarded as consisting in the relative motions of the molecules or particles. The greater the energy of the motion the higher the temperature of the body, so long as it maintains its original state, solid, liquid, or gaseous; and an alteration in the nature of the motion probably constitutes the change from one of the states of matter to another. After the time of Rumford and Davy, Fourier and Carnot were highly distinguished for their inquiries into the mathematical theory of heat. Fourier investigated the theory of conduction and radiation, while on the investigations of Carnot has been founded the branch of Thermo-dynamics, which treats of the conversion of heat into mechanical force or energy, and *vice versâ*. (See *Thermo-dynamics*.) The investigations of Joule and the discovery of the quantitative equivalence of energy with heat, led to the enunciation of the theory of the *conservation of energy*. See *Energy*.

Heat-engine. See *Thermo-dynamic Engine*.

Heath (hēth), the common name of many plants of the nat. order Ericaceæ. Those that belong to the genus *Erica* have their leaves simple and entire; their flowers oval, cylindrical, or even swelled at the base; the corolla is four-cleft; the stamens eight, terminated by anthers which are usually notched or bi-aristate at the summit, and the fruit dry, four or eight-celled. From 400 to 500 species are known, twelve or fifteen of which inhabit Europe, and have small flowers, whilst all the remainder are natives of South Africa (the vicinity of the Cape of Good Hope). Many of them bear brilliantly colored flowers.

Heathfield (hēth'fēld), George Augustus Elliot, Lord, a British general, born in Roxburghshire in 1718; died in 1790. He studied at the University of Leyden, and at the French military school at La Fère, and served for some time in the Prussian army. He entered the British army in 1735, was wounded at Dettingen in 1743, and in 1762 took part in the capture of Havana. In 1775 he became commander-in-chief of the forces in Ireland, and soon after governor of Gibraltar. Spain and France having sided with America against Britain, Gibraltar was besieged by the two former powers, and successfully defended by Elliot from 1779 to 1783, the siege and defence being among the most memorable in history. The king sent Elliot the order of the Bath, and shortly after he returned to England, and was created Baron Heathfield in 1787.

Heat Spectrum, the part of the spectrum from an incandescent body that contains invisible heat rays. To produce the heat spectrum properly lenses and prisms of rock-salt must be employed. When the spectrum from the sun is examined it is found that the maximum heat intensity is in the darkheat spectrum at a considerable distance from the place where light ceases to be perceptible.

Heaven (hev'n; probably signifying that which is *heaved* up or elevated), in a physical sense, the azure vault which spreads above us like a hol-

low hemisphere, and appears to rest on the earth at the horizon. It is in reality merely the appearance presented to us by the immeasurable space in which the heavenly bodies move. According to some its azure color is due to the light of the celestial bodies reflected from the earth to the air, and thence back again. According to others the reflection is not from the air, but from its contained vapors. A theory recently broached assigns the azure color to the presence of particles of dust in the air. In theology, this word denotes a region of the universe where God's presence is especially manifested, in contrast with the earth. According to the Hebrew scriptures heaven consisted of three regions:—(1) That of the clouds, or air; (2) that of the stars; and (3) the abode of God. They also divide it into two parts, 'The Heaven' and the 'Heaven of Heavens.' Among the Greeks the gods were supposed to reside on Olympus, and the classic poets placed the abode of the just in the Elysian fields. The heaven of Islam is a scene of sensuous enjoyment, while that of the Buddhist consists in *Nirvana*, regarded by some as meaning the absorption of individual existence in the great ocean of being. The ancient German had his Walhalla, and the American Indian has his happy hunting grounds. Among Christians the general opinion is that heaven is the residence of the Most High, the holy angels, and the spirits of just men made perfect, that this abode is eternal, and its joys intensely spiritual.

Heavy Spar.

See *Baryta*.

Hebe (hē'bē), in Greek mythology, the goddess of youth, and the cup-bearer to the gods, until replaced by Ganymede, a daughter of Zeus and Hera, who gave her as a wife to Heracles. In the arts she is represented with the cup in which she presents the nectar, with the figure of a charming young girl, her dress adorned with roses, and wearing a wreath of flowers.

Hebe, by Canova.

Heber (he'bĕr), Reginald, an English poet and bishop, was born in 1783; died in 1826. In 1800 he entered Brasenose College, Oxford, and in 1803 wrote his celebrated prize poem of *Palestine*. After traveling on the continent he became, in 1807, rector of Hodnet, and having married Amelia, daughter of the dean of St. Asaph, was appointed prebend of the cathedral. On the death of Bishop Middleton, Heber was consecrated Bishop of Calcutta in 1823; but he had only occupied the position for about two years when he died of apoplexy at Trichinopoli, in 1826. In addition to his hymns, the best known productions are *Palestine;* an edition of the works of Jeremy Taylor (with *Life*); *Poems and Translations*.

Hébert (ā-bār), Jacques René, notorious during the French revolution, was born at Alençon in 1757; was executed in 1794. Hébert first attracted notice as editor of the violent Jacobin organ *Le Père Duchesne*. In 1792 he became a member of the municipality of Paris, which contributed to the massacres of September, and he was named attorney-general under the commune. In 1793 the Girondists procured his arrest, but he was released by the convention. He was one of those who established the worship of reason, and he was always on the side of bloody measures. Having denounced Danton, the latter, in conjunction with Robespierre, secured his arrest and decapitation with the guillotine in 1794.

Hebrew Language and Literature

(hē'brö), the language and literature of the Jews, Israelites, or Hebrews, especially at that period when they formed a compact nation inhabiting Canaan or Palestine. (For a sketch of the history of the people see *Jews*.) The Hebrew language forms a branch of the Semitic family of languages, being akin to the Aramaic (Chaldee and Syriac), Arabic, Ethiopic, and Assyrian. In the antiquity of its extant literary remains Hebrew far surpasses the other Semitic idioms, and in richness and development is only inferior to the Arabic. The language is deficient in grammatical technicalities, especially in moods and tenses of the verb, in the absence of the neuter gender, etc. Its roots are triliteral (consisting of three consonants), and words are derived from them by the reduplication of the letters of the root, and by the addition of formative elements before and after the roots. The alphabet is composed of twenty-two consonants, the vowels being expressed by marks above or below these letters. The accents and marks of punctuation amount to about forty. The writing is from right to left. There are three kinds of Hebrew alphabet now in use—the square or Assyrian (properly called the Babylonian), the

most common; the rabbinical, or mediæval; and the cursive, or alphabet used in ordinary writing.

The extant classical Hebrew writings embrace a period of more than 1000 years from the era of Moses to the date of the composition of the books of Chronicles, which stand last in the Hebrew Bible. During this period the written language underwent surprisingly little change. In passing from the book of Genesis to the books of Samuel we do not recognize any very striking difference in the language. Even those who assert that the Pentateuch as a whole is of a comparatively late era, admit the great antiquity of some of its contents, which do not differ in language from the rest. There is indeed to be observed a very decided difference in style and language between the earliest and the very latest Hebrew writings; but this change was sudden, hence Hebrew literature is distinguished into Pre-exilian and Post-exilian, the Babylonish captivity forming the break between the two. The writings which belong to the age subsequent to the Babylonish captivity differ very considerably from those which belong to the preceding age; the influence of the Aramaic or Chaldee language, acquired by the Jews in the land of their exile, having greatly corrupted the tongue. The historical books belonging to this age are the books of Chronicles, Ezra, Nehemiah, and Esther. In the prophets who prophesied during and after the captivity, with the exception of Daniel, the Aramaic impress is by no means so strong as we might anticipate, they having evidently formed their style on that of the older prophets. At what time Aramaic became the dominant element in the national language it is impossible to determine, but eventually it entirely took the place of the old Hebrew as a spoken tongue. The fragments of the popular language in the New Testament are all Aramaic; and ever since the Hebrew proper has been preserved and cultivated only as the language of the learned and of books, and not of common life.

After the return from the captivity, the Jewish literature was carefully cultivated. Under Ezra the Scriptures were collected, and arranged into a canon. The Pentateuch was publicly read, taught in schools, and translated into Aramaic. The legal or religious traditions explanatory or complementary to the law of Moses were collected and established as the oral law. These labors resulted in the *Midrash*, a general exposition of the Old Testament, divided into the *Halucha* and the *Haggada*. To the Maccabean era belong the *Apocrypha* (in Greek), various Greek versions of the Bible, and several collections of prayers, poems, and proverbs. To the succeeding epoch belong some celebrated doctors of the law—Hillel, Shammai, Gamaliel, and others; while the age following the destruction of Jerusalem (A.D. 70) witnessed the completion of the New Testament and the works of Josephus, written, however, in the Greek language. On being driven from their capital by the Romans, numerous schools were established by the Jews in which their language and literature were taught. Of these schools the most celebrated were those of Babylon and Tiberias. The *Mishna*, which contains the traditions of the Jews and interpretations of the Scriptures, is supposed to have been compiled in the latter part of the second or in the earlier part of the third century; and the rabbis of Tiberias and Babylon wrote numerous commentaries on it. These commentaries were at length collected into two separate works, the Jerusalem and the Babylonian *Talmuds*. The Jerusalem *Talmud* seems to have been completed about the end of the fourth century, and the Babylonian *Talmud* about a century later, under the care of Rabbi Ashe. What are called the *Targums*—that is Aramaic translations of portions of the Old Testament—belong partly to times somewhat anterior, partly to times subsequent to this period. The Jews latterly adopted the languages of the various peoples among whom they happened to dwell, though they also wrote in classical Hebrew as well as in the less pure form of the *Rabbinical* Hebrew. The most brilliant epoch of mediæval Jewish literature is that of the domination of the Moors in Spain. Of modern literature in the Hebrew language there is little that is of general interest.

Hebrews (hē'brōz), EPISTLE TO THE, one of the books of the New Testament, the canonicity and authorship of which have been much discussed. The immediate successors of the apostles (Clement of Rome, Justin Martyr, etc.) seem to have considered it as of canonical authority. Its canonicity was also maintained by St. Jerome, by the almost universal consent of the Latin and Greek churches, and by Ambrose of Milan; while in 416 a decretal of Innocent I was issued in favor of this view. As to the authorship, the early Roman church denied its Pauline origin. In Carthage it was (in the second century) ascribed to Barnabas, while at the same time in Alexandria it was ascribed to Paul. This view was supported by Clement of Alexandria, and Origen, the

former believing that it was written by Paul in Hebrew, and translated into Greek by Luke. Latterly the Pauline authorship became generally accepted throughout Christendom, but in modern times the prevalent opinion is that Paul was not the author. The epistle was probably addressed to a Jewish section of the Roman church, although some maintain that it was addressed to Jews of Alexandria. If the latter view be correct Apollos may be the author, although tradition seems to favor the claim of Barnabas. The question is apparently one incapable of settlement.

Hebrides (heb'-ri-dēz), or WESTERN ISLANDS (the *Heboudai* of Ptolemy, and *Hebudes* of Pliny, the *r* being an erroneous insertion), a series of islands and islets off the west coast of Scotland, usually divided into the Outer Hebrides (popularly called the Long Island), and the Inner Hebrides. The islands within the Firth of Clyde are not now considered as part of the Hebrides. The Hebrides are divided between the shires of Ross, Inverness, and Argyle. They number upwards of 400 in all, but only about 90 are inhabited; area, about 2800 square miles; population, about 100,000. The islands are, on the whole, mountainous, and abound in moss and moors. Although humid, the climate is mild. The soil is mostly poor, and agriculture, except in certain localities, especially Islay, is very backward. Oats and barley, with potatoes and turnips, constitute almost the entire produce of the soil. Cattle-rearing and fishing are staple industries. The land is mainly occupied by sheep-farmers, and by great numbers of crofters occupying small pieces of arable land and having often the right in common with others to a tract of rough pasture. There are also many cottars or subtenants, and excess of population has arisen in various localities from the minute subdivision of land. The condition of the inhabitants generally, is very depressed; their dwellings miserable—the older being without chimneys or windows—and their living poor. Gaelic is the universal language, although English is tolerably well known. The Hebrides were early colonized by Norwegians, and belonged to Norway from the ninth to the thirteenth century, being annexed to Scotland in 1266. In 1346 a chief of the Macdonald clan assumed the title of 'Lord of the Isles,' and he and his successors affected a sort of semi-independence, but the Hebrides were finally annexed by James V in 1540.

Hebron (hē'brun; anciently *Kirjath-arba* or *Mamre*, now *El-Khalil*), a town in Palestine, 18 miles south by west of Jerusalem, 2835 feet above sea-level. It lies in the narrow valley of Mamre, and was one of the three cities of refuge west of the Jordan. Its streets are narrow and dirty. A mosque, called *El-Haram*, formerly a church, contains the alleged tombs of Abraham, Isaac, Jacob, Sarah, etc. Hebron is one of the oldest of existing towns. It was the residence of Abraham and the patriarchs, and at one time of David. Pop. about 15,000.

Hecatæus (hek-a-tē'us), an eminent ancient Greek historian and geographer, born (probably) about 550 B.C.; died about 476 B.C. He visited Egypt, Thrace, Greece, the coasts of the Euxine, Italy, Spain, and Africa. His two great works were his *Tour of the World* and his *Genealogies* or *Histories*. Only fragments of his writings are extant.

Hecate (hek'â-tē, or he'kât), an ancient Greek goddess, whose powers were various. She could bestow wealth, victory, and wisdom; good luck on sailors and hunters; prosperity on youth and on the flocks. She was latterly confounded with other divinities, such as Demēter, Artĕmis, and Persephonē (Proserpine), and finally became especially an infernal goddess, and was invoked by magicians and witches. Dogs, honey, and black female lambs were offered to her at places where three roads met. She was often represented with three bodies or three heads, and with serpents twined round her neck.

Hecatomb (hek'a-tom, or hek'a-tōm; Greek *hecaton*, a hundred, *bous*, an ox), in ancient Greek worship literally a sacrifice of a hundred oxen, but applied generally to the sacrifice of any large number. It was necessary that the victims should be without blemish. Only parts such as the thighs, legs, or hide were burned, the rest furnishing the festive meal at the close of the sacrifice.

Heckles (hek'lz), or HACKLES, an apparatus employed in the preparation of animal and vegetable fibers for spinning. It consists of a series of long metallic teeth, through which the material is drawn so as to comb the fibers out straight and fit them for the subsequent operations. The teeth are fixed in a wooden or metallic base, in several rows, alternating with each other at short distances apart.

Heckmondwike (hek'mund-wīk), a thriving town of England, county of York (West Riding), with extensive blanket, carpet, woolen

cloth, and woolen yarn manufactories. Pop. 9017.

Hecla, or HEKLA (hek'la), a volcano of Iceland, about 20 miles from its southwest coast, about 5000 feet in height, and having several craters. It is composed chiefly of basalt and lava, and is always covered with snow. Many eruptions are on record. One of the most tremendous occurred in 1783, after which the volcano remained quiescent till September, 1845, when it again became active, and continued with little intermission till November, 1846, to discharge ashes, some masses of pumice-stone, and a torrent of lava. The last outbreak was in 1878.

Hector (hek'tur), the son of Priam and Hecuba, the bravest of the Trojans, whose forces he commanded. His wife was Andromache. His exploits are celebrated in the *Iliad*. Having slain Patroclus, the friend of Achilles, the latter sought revenge, and Hector was slain by him. The body of Hector was dragged at the chariot wheels of the conqueror; but afterwards it was delivered to Priam for a ransom, who gave it a solemn burial. Hector is the most attractive warrior in Homer's *Iliad*, in which one of the finest episodes is his parting from Andromache before his last combat.

Hector, ANNIE ALEXANDER, an Irish novelist, born in 1825; died in 1902. Under the title of Mrs. Alexander she wrote many popular novels, among the best known of them being *Her Dearest Foe* and *The Wooing o't.*

Hecuba (hek'ū-ba), of Phrygia, in Greek legend the second wife of Priam, king of Troy, to whom she bore Hector, Paris, Cassandra, Troilus, and other children. After the fall of Troy she was given as a slave to Odysseus, and, according to one form of the legend, in despair leaped into the Hellespont.

Heddle (hed'l), in a loom, one of the parallel double threads which are arranged in sets, and with their mounting, compose the *harness* for raising the warp threads to form the shed and allow the shuttle to pass. Each heddle has a loop or eye in its center, through which a warp thread passes.

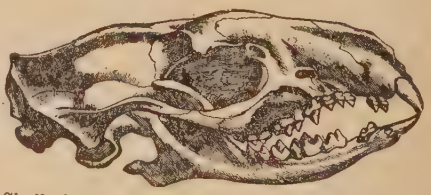
Hedera (hed'ér-a), the genus to which ivy belongs.

Hedge (hedj), a fence formed of living trees or shrubs. Hedges are often composed of one or more of the following:—Hawthorn, crab, blackthorn, holly, privet, beech, hornbeam, maple, barberry, furze, broom, alder, poplar, willow, yew, box, arborvitæ, sweet-briar, etc. Although superior to dry-stone walls, they take up much room, and exhaust the soil to some extent. Hedges are probably more common in England than in any other country, though they were not so common till the close of the seventeenth century. They are increasing in use in the United States, various plants being used, among which privet has recently become very popular.

Hedgehog (hedj'hog; *Erinacĕus Europæus*), an insectivorous animal, covered with spines in lieu of hair. By means of a special muscle it is able to roll itself up into a ball,

Hedgehog (*Erinaceus Europæus*).

and in this form can defy most of its enemies. It has a rudimentary tail, elongated nose, short ears, with a cranium comparatively broad. The hind feet have five toes, and strong coarse hair covers some parts of the body. The teeth are numerous. Including the tail, it attains a length of 11 inches. It usually resides in small thickets, and feeds on fruits, roots, and insects. It is fond of raw or roasted flesh, and devours cockroaches in large numbers when kept in houses. It hibernates in winter. The female bears four to eight young at a birth, the young soon becoming covered with prickles. It is found in most parts of Europe. Other species are found in Asia and Africa.



Skull of common Hedgehog (*Erinaceus Europæus*).

Hedgehog Plant, a name bestowed on leguminous plants of the genus *Medicāgo* (especially *M. infestata*) whose pods are spirally twisted and rolled up into a ball and furnished with prickles.

Hedge-mustard (*Sisymbrium*), a cruciferous plant, common in waste places.

Hedin, SVEN, a Swedish traveler, born at Stockholm in 1865. He traveled in Persia and Mesopotamia in 1885–86, was sent on an embassy to Persia in 1890, and continued his travels in Asia until 1897, crossing through East Turkestan, the Pamir, and North Tibet. Returning in 1906, he continued his explorations in an almost unknown region, the vast expanse of West Tibet, which he crossed twice from north to south, finding the country wildly mountainous, with intervening valleys and many lakes, generally salt. He returned in 1908, having discovered the true sources of the Bramaputra and Indus rivers. He wrote *Through Asia* and other works.

Hedjaz. See *Hejaz.*

Hedjrah. See *Hejra.*

Hedonism (hē'don-ism), the ethical theory according to which pleasure is held to be the chief good. In Greek ethics hedonism was represented by the Cyrenaic and Epicurean schools. The classical exposition of the modern type of hedonism is found in Mill's *Utilitarianism,* although his argument is generally admitted not to be free from serious inconsistencies. Utilitarianism really aims at the greatest happiness of the greatest number, a collective rather than individual good.

Hedysarum (h e - d i s' a-rum). See *French Honeysuckle.*

Heem (hām), JAN DAVID DE, a Dutch painter of fruit, flowers, and still life, born in 1600; died in 1674. He studied under his father, and soon obtained large sums for his pictures, which are characterized by great delicacy and attention to detail and truth and brilliancy of coloring. His *Madonnas,* etc., bordered with garlands of fruits and flowers, were also famous.

Heeren (hā'rĕn), ARNOLD HERMANN LUDWIG, a German historian, born in 1760; died in 1842. In 1776 he entered the gymnasium of Bremen, and in 1784 took his degree of Doctor of Philosophy at Göttingen. In 1787, after returning from his travels in Italy, he became professor extraordinary of philosophy at the same university. In 1801 he was elected professor of history. His writings combine extreme accuracy of statement with picturesqueness of style. His principal productions are *Geschichte der classischen Lieder im Mittelalter; Handbuch der Geschichte der Staaten des Alterthums,* etc.

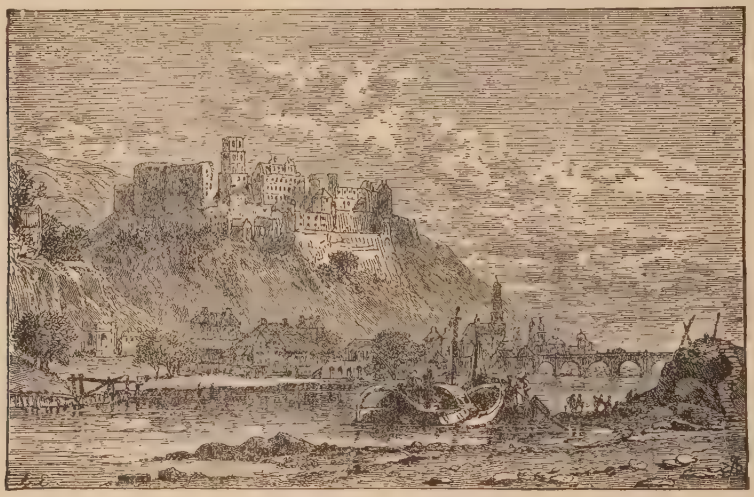
Hegel (hā'gl), GEORG WILHELM FRIEDRICH, a celebrated German metaphysician, born at Stuttgart in 1770; died in 1831. He studied at the theological institute of Tübingen from 1788-93, and was next a private tutor at Berne (1793-96), and subsequently at Frankfort-on-the-Main (1797-1800). Having removed to Jena, and contracted an intimacy with Schelling, he devoted himself to metaphysical study. After the battle of Jena, Hegel was employed on a newspaper at Bamberg until 1808, when he became successively rector of Nürnberg Gymnasium, professor of philosophy at Heidelberg (1816), and at Berlin from 1818 to his decease in 1831. Among his works the most important are his *Phänomenologie des Geistes* (1807), *Wissenschaft der Logik* (1812-16), *Encyclopädie der philosophischen Wissenschaften* (1817), and *Grundlinien der Philosophie des Rechts oder Naturrecht und Staatswissenschaft* (1821). The philosophy of Hegel followed that of Schelling, in adopting as a presupposition the indentity of Knowing and Being, of Thought and Reality, of Subjective and Objective. But he differs from Schelling, who contemplates this indentity with its inner opposites through the medium of a purely intellectual intuition, for Hegel seems rather to revert to Kant's Transcendental Logic. He thus asserts that if the order and connection of our thoughts is involved in the order and connection of things, the universal form in the course of objective action must exactly agree with the form of the development of our thoughts, and *vice versa.* As there are, according to him, three stages in the process of thought and existence, his system has necessarily a threefold division: logic; the philosophy of nature; and mental philosophy. Hegelianism has been more influential in the direction of the philosophy of religion than in any other department; but it is divided into three camps, representing respectively the supernatural, the rational, and the mystical.

Hegira (hej'i-ra.) See *Hejra.*

Heide (hī'dĕ), a town of Prussia, in Holstein, with manufactures of paper, etc. Pop. (1905) 8758.

Heidelberg (hī'dl-berh), a town of Baden, beautifully situated on the left bank of the Neckar, here crossed by two bridges, in one of the loveliest districts of Germany. It stands on a narrow strip between the river and the castle-rock and Geisberg, spurs of the Königstuhl (1850 ft.); and chiefly consists of one main street and less important cross and parallel streets. The principal

buildings are: the church of St. Peter; the church of the Holy Ghost; the castle, anciently the residence of the Electors Palatine; the university, founded in 1386, and now possessed of a library of 500,000 volumes and attended by about 1000 students; the town-house, etc. The castle, begun late in the thirteenth century, and exhibiting elaborate examples of early and late renaissance architecture, is the most



Castle and Town of Heidelberg.

remarkable edifice in Heidelberg. It is now an ivy-clad ruin, but is carefully preserved from further decay. The principal industry is brewing. Pop. (1910) 56,016.

Heidelberg Catechism. The Heidelberg of Palatinate Catechism is of greater importance than any other as a standard of the German reformed churches. It was compiled by the Heidelberg theologians, Caspar Olevian and Zacharias Ursinus, at the request of the Elector Frederick III of the Palatinate; it was published in 1563, was approved by several synods, and was subjected to revision by the Synod of Dort.

Heidenheim (hī'dĕn-hīm), a town of Würtemberg, 46 miles E. S. E. Stuttgart. It has manufactures of woolen and linen cloth, etc. Pop. (1905) 12,173.

Heights, Measurement of, or Hypsometry, is that department of geodesy which treats of the measurements of the absolute or relative heights of various points on the earth's surface. In all cases in which great accuracy is essential, trigonometrical methods must be employed, but in other cases sufficiently accurate results may be obtained by leveling, by the use of the barometer, or by the boiling-point of water as given by the thermometer. The trigonometrical method is often the only one available, as the height to be measured may be quite inaccessible. The barometric method is based on the fact that as the mercurial column is supported by the atmospheric pressure, it must fall when conveyed from a lower to a higher level, as in the latter case the pressure is diminished. Were the atmosphere uniform in density throughout, nothing could be simpler than the measurement of heights by the barometer, but gases being very compressible, the lower strata of the atmosphere are denser than the upper strata, being exposed to greater pressure. Thus a column of air 100 feet high has far greater weight at the sea-level than a similar column at the top of a mountain 4000 feet high; and the effect on the barometric column of rising 100 feet from sea-level is correspondingly greater than the effect of rising 100 feet from a height of 4000 feet above the level of the sea. Moreover, increase of temperature affects the density of the mercury in the barometer, and also that of the air, and further complicates the problem. Hence for the greatest accuracy in determining the difference of levels

two mercurial barometers and four thermometers are required. Two of the thermometers are used for determining the temperature of the air at the stations, and two are attached to the barometers for determining the temperature of the mercury. The observations are made simultaneously. The aneroid barometer is in some respects more suitable than the mercurial, being much more portable, and requiring two thermometers only. After the necessary observations are made the required height may be calculated by the use of certain logarithmic formulæ, or by the rough method stated under *Barometer*. Tables obviating the use of logarithms are often supplied by instrument makers along with aneroid barometers. The method in which use is made of the principle that water boils at the temperature of 212° under the full pressure of the atmosphere but at a lower temperature with a smaller atmospheric pressure, such as is given by an elevated position, is simple and sufficiently accurate for many purposes. It has been found that if water at the sea-level boils at 212°, on rising 510 feet it will boil at 211°, and so on.

Heilbronn (hīl-bron'), a town of Würtemberg, beautifully situated on the Neckar, largely mediæval in architecture in the older parts, but having modern suburbs. Its finest edifice is the old Gothic church of St. Kilian. It has flourishing industries. Heilbronn was long an imperial free town. Pop. (1910) 42,709.

Heiligenstadt (hī'li-gen-stât), a town of Prussia, prov. Saxony, on the Leine. It has cigar and other manufactures. Pop. 7955.

Heilprin (hīl'prin), ANGELO, geologist, born in Hungary in 1853, was brought to America in 1856, and became a student in and director of the Academy of Natural Sciences of Philadelphia. Was president for five years of the Geographical Society of Philadelphia, leader of the Peary Relief Expedition of 1892, and traveled in many countries. He wrote *Geographical and Geological Distribution of Animals, Geological Evidences of Evolution, The Arctic Problem*, with works describing the 1902 eruption of Mont Pelee, which he investigated. He died July 17, 1907.

Heimdall (hīm'dal), a divinity in the Scandinavian mythology, who keeps watch on the bridge Bifröst, which connects the domain of the Æsir or Gods with that of men. His sight and hearing are acuter than those of mortals, and nothing can evade his vigilance.

Heine (hī'nē), HEINRICH, a German poet and author, was born of Jewish parents at Düsseldorf in 1799, and died at Paris in 1856. He studied law at Bonn, Berlin, and Göttingen; took his degree at the last-mentioned place, and in 1825 embraced Christianity. He afterwards lived at Hamburg, Berlin, and Munich, but in 1830 he settled in Paris, supported himself by his literary labors, and dwelt there until his death. From 1837 to the overthrow of Louis Philippe in 1848 he enjoyed a pension of 4800 francs from the French government. Of the numerous literary works of Heine there may be mentioned in particular—*Gedichte* ('Poems'); *Reisebilder* ('Pictures of Travel'); *Buch der Lieder* ('Book of Songs'); *Deutschland Ein Wintermärchen* ('Germany, a Winter Tale'); *Atta Troll; Romanzero*, etc. As a poet Heine is remarkable for the simplicity and pathos of many of his lyric pieces. His powers of wit and raillery were also great, but he often transgressed the bounds of propriety and decorum. Scepticism and oversensuousness are his two prominent characteristics. During the latter years of his life he suffered great agony from a spinal complaint, which confined him almost constantly to bed.

Heineccius (hi-nek'se-us), JOHANN GOTTLIEB, a German writer on logic, jurisprudence, and ethics, born in 1681; died in 1741. His works on Roman law were highly valued.

Heinrich (hīn'rih), the German form of *Henry*.

Heinsius (hīn'si-us), DANIEL, a Dutch scholar, poet, and critic, born 1580; died 1655. He studied at Franeker and Leyden, at the latter under Joseph Scaliger; became professor of history and politics at Leyden in 1605, and librarian and secretary in 1607. He published editions of Hesiod, Horace, Virgil, and other classical writings, and wrote Latin and Greek poems.

Heir (ār). See *Descent*.

Heir-apparent, the person who necessarily succeeds to the ancestor if he survives him, because no other person can ever gain precedence over him, as an eldest son. Compare *Heir-presumptive*.

Heirloom (ār'lōm), in law, means some personal chattel which goes by special custom to the heir-at-law, together with the inheritance. The term is often applied to the case where certain chattels, such as pictures, etc., are directed by will to follow along with the estate.

Heir-presumptive is one who, if the ancestor should die immediately, would, under existing circumstances, be his heir, but whose right of inheritance may be defeated by some nearer heir being born, as an only daughter, who is displaced by the birth of a son. Compare *Heir-apparent.*

Hejaz (hej-äz′) or HIJAZ, a division of Arabia, extending along the north half of the east coast of the Red Sea, comprehending a lowland (Tehâma) and a tract of highlands, east of a range of mountains attaining a height of perhaps 8000 feet. Mecca, Medina, Jiddah, and Yambo are the chief towns, the first two being annually resorted to by vast numbers of pilgrims. Long a part of Turkey, it declared its independence in 1917.

Hejra, HEJIRA, or HEGIRA (hej′i-ra), an Arabic word signifying emigration. The Mohammedans designate by it the flight of Mohammed their prophet from Mecca to Medina. From this flight, which happened on the 13th of September, 622 A.D., but which they fix on the 16th of July of the same year, they begin their computation of time.

Hel, the Norse goddess of the dead, who dwells beneath one of the three roots of the ash Yggdrasil; daughter of Loki. Dark rivers surround her abode; a dog watches without; the horse she rides has three feet; she herself is half black and half of fair complexion.

Helamys (hel′a-mis), the jumping-hare or jumping-rat, a genus of rodent animals allied to the jerboas.

Helbeh (hel′be), the seed of a plant of the leguminous genus *Trigonella* (fenugreek), with a somewhat bitter taste, whose flour, mixed with dhurra, is used as food by the laborers of Egypt.

Helder (hel′dėr), a fortified seaport of Holland, in the most northern part of the province of North Holland, opposite the island of Texel, and commanding the entrance to the Zuider Zee. From a fishing town Napoleon converted it to a fortress and naval station of the first rank, and called it his Northern Gibraltar. Being much exposed, the port and coasts are protected by gigantic [illegible] one 6 miles long and built entirely [illegible]wegian granite. Pop. 27,458.

Helen (hel′en), or HEL′ENA, in ancient Greek legend, the most beautiful woman of her age, daughter of Zeus by Leda. By advice of Ulysses her numerous suitors were bound by oath to respect her choice of a husband, and to maintain it even by arms. She chose Menelaus, but was afterwards carried off to Troy by Paris, the Trojan war arising from the claim made by Menelaus for the fulfilment of the oath. After the death of Paris she married his brother Deiphobus. On the fall of Troy she returned to Sparta with Menelaus, but was murdered at Rhodes.

Helena (hel′e-na), a city, county seat of Phillips Co., Arkansas, on Mississippi River, 70 miles S. W. of Memphis, in a cotton and hardwood timber section, with compresses, wood-working plants, etc. Pop. (1920) 9112.

Helena, the capital of Montana, county seat of Lewis and Clark Co., located in the Rocky mountains (elevation 4083 feet), 72 miles N. of Butte, in a mining, milling and smelting region, which has rich deposits of silver, gold, lead, copper, zinc and other metals. It is on the Northern Pacific and Great Northern railroads, and has smelters, testing and engineering plant, etc. Production of Last Chance Gulch, $35,000,000; of Alta, $32,000,000. Montana Wesleyan University is here. Pop. (1920) 12,037.

Helena, the name of several saints, of whom the chief was the mother of the Emperor Constantine the Great, a woman of humble origin, and a native either of Bithynia or of Britain. She became the wife of Constantius Chlorus, who, however, was compelled to repudiate her when made Cæsar by Diocletian in 292 A.D. At the same time he made her son his sole heir, and Constantine, on his accession, took her to reside with him at the palace, and gave her the title of Augusta. She did much for the advancement of religion, and is said to have discovered the *true cross,* in honor of which she founded the Church of the Holy Sepulcher at Jerusalem. She died shortly after at the age of eighty, in 328 or 326 A.D.

Helena (he-lē′na), ST., an island in the South Atlantic, belonging to Britain, about 850 miles southeast of the Island of Ascension, 1150 miles west from the west coast of S. Africa, and 2000 miles from the east coast of Brazil; greatest length, 10½ miles; greatest breadth, 7 miles; area, about 47 square miles. Its position, in the ocean thoroughfare from Europe to the East, has made it a place of call for vessels, while it has acquired special celebrity as the place of Napoleon's banishment, and where he resided from 1816 till his death in 1821. It has precipitous and almost inaccessible coasts, particularly on the north, where nearly perpendicular cliffs rise to a height of from 600 to 1200 feet. The only town on the island is James Town, which has a fine natural harbor,

and affords excellent anchorage in 12 fathoms. The island, which is of volcanic formation, derives its name from having been discovered by Juan de Nova Castilla on St. Helena's Day. It was afterwards possessed by the Dutch, and finally was ceded to the English about 1651. During the British-Boer War (1900) Com. Cronje and over 4000 of his army were deported here after their capture by the British under Gen. Kitchener. Pop. about 5000.

Helensburgh (hel'enz-bur-rō), a town of Scotland, in Dumbartonshire, at the entrance of the Gare Loch, on the north shore of the Firth of Clyde, opposite Greenock, from which it is distant about 4 miles. It is chiefly a residential town and summer resort for Glasgow and neighboring towns. It takes its name from Helen, wife of Sir James Colquhoun, by whom it was founded in 1777. Pop. 8554.

Helenus (hel'en-us), a Trojan soothsayer, son of Priam and Hecuba, twin-brother of Cassandra, and husband of Andromache after Hector's death. He foretold the destiny of Æneas.

Heliacal (he-lī'a-kal), in astronomy, rising or setting at the same time, or nearly the same time, as the sun. The heliacal rising of a star is when, after being in conjunction with the sun and invisible, it emerges from the light so as to be visible in the morning before sunrising. On the contrary, the heliacal setting of a star is when the sun approaches so near as to render it invisible by its superior splendor.

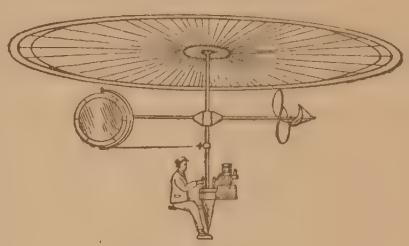
Helianthemum (hē-li-an'the-mum), a genus of herbaceous undershrubs and shrubby or creeping plants; the rock-rose genus.

Helianthus (hē-li-an'thus), a genus of Compositæ, chiefly North American annual or perennial herbs, with rough leaves and large yellow flowers, of which the common sunflower (*H. annuus*) and the *H. tuberōsus* (the Jerusalem artichoke) are examples.

Helicidæ (he-lis'i-dē), the general name by which the land shell-snails are distinguished. See *Helix*.

Helicon (hel'i-kon; now *Sagara*), a mountain range of Greece, in the west of Bœotia, in some sense a continuation of the range of Parnassus. It was the favorite seat of the Muses, who, with Apollo, had temples here. In it also were the fountains of Aganippe and Hippocrene. The highest summit, now called *Paleovuni*, is barely 5000 feet high.

Helicopter (hel'i-kop-tėr), an aeroplane flying machine with a vertical screw arrangement to lift it into the air, and other power apparatus to give it horizontal motion. It has



Villard's Helicopter.

not yet been practically realized, though some experiments have been made.

Helictis (hel-ik'tis), a genus of carnivorous quadrupeds, allied to the skunks, of which there are at least two species, one (*H. moschāta*) found in China, the other (*H. nepalensis*) in India.

Helier (hel'yėr), St., the capital of the island of Jersey, on the south coast, on the east side of St. Aubin's Bay. It is protected by two fortresses, Elizabeth Castle on a rock in the bay, opposite the town; and Fort Regent, overlooking the inner harbor. The chief public buildings are Parliament House, the court house, and the public library. The harbor, docks and quays are commodious, and there is a considerable shipping trade. The mild climate and cheapness of living make it a favorite place of residence and summer resort. It is the seat of the states, or representative parliament of Jersey, and the terminus of two small railways. Pop. about 30,000.

Heligoland (hel'i-gō-land; Germany, *Helgoland*—Holy Land), an island belonging to Germany, in the North Sea, about 40 miles from the mouth of the Elbe; 1 mile long and 1/3 mile broad; highest point 200 feet. Its rocks present a perpendicular face to the sea, but are being rapidly corroded by the waves. The inhabitants, of Frisian descent, are mainly fishers and pilots, but the town is a popular bathing resort. Heligoland was captured by Britain from Denmark in 1807, and conceded to Germany in 1890, being annexed to the Prussian province of Schleswig-Holstein in 1892. It was strongly fortified and was of great importance in the European war (q. v.), 1914-18, as an aeroplane and

naval base. The treaty of peace, 1919, ordered the forts destroyed. Pop. 3000.

Heliodorus (hel-i-o-dō'rus), a Greek romance writer, born at Emesa, in Syria, about the fourth century. The work that has come down to us is the *Æthiopica*, the oldest and best of the Greek romances. It is a tale of adventure in poetical prose, with an almost epic tone. The romance is supposed to have been written in his early years before he became a Christian and Bishop of Tricca in Thessaly. It is, however, sometimes asserted that Heliodorus was a sophist of the third century, who has been erroneously confounded with the bishop.

Heliogabalus (hel-i-o-gab'a-lus), or ELAGABALUS, a Roman emperor, son of Sextus Varius Marcellus; born about A.D. 205, and originally called *Varius Avitus Bassianus*. He received his name from having been, while still a child, priest of Elagabalus, the Syro-Phœnician sun-god. After the death of Macrinus he was invested, at the age of fourteen, with the imperial purple, but his licentiousness soon displeased the populace, and he was slain in an insurrection of the prætorians, A.D. 222, after a reign of less than four years.

Heliograph (hē'li-u-graf), or HELIOSTAT, a name given to various contrivances for reflecting the sun's light either temporarily or continuously to an observer at a distance. The simplest heliostat is a mirror hung up at a distant station so as to reflect a flash to the observer whose station may be many miles from it. This mirror is generally so adjusted that the flash occurs exactly at some prearranged hour, and by being in readiness the observer can get an observation with precision as regards time. Some heliostats are visible for 200 miles. By being fitted with an adjustment of clock-work, the mirror can be made to revolve with the sun, and thus reflect a beam of sunlight steadily in one direction, being then called also *heliotrope*. The heliostat has been used for signaling in war.

Heliogravure (hē-li-o-gra'vūr), a term used to denote the process of photo-engraving or a print obtained by that process; strictly a photo-engraved metal plate. Originally any process by which engravings were printed either like woodcuts or like copperplates was called photogravure.

Heliolite (hē'li-u-līt), a synonym of sunstone or aventurine felspar.

Heliometer (hē-li-om'e-tėr), an instrument for measuring small distances on the sky, particularly the apparent diameters of the sun and of the moon. In the common modern form the object-glass of the telescope is cut into two halves, relatively movable by a screw. Each half forms a perfect image in the focus of the eye-piece, and by varying the distance between the half-lenses the images may be made to diverge from, or approach, each other. If, in contemplating a celestial body, the object-glasses are placed so as to bring the images to touch each other, the distance of the centers of the object-glasses, measured in seconds, gives the diameter of the image.

Heliopolis (hē-li-op'u-lis; City of the Sun), the Greek name of the city called by the Egyptians On, An, stood on the E. side of the Pelasiac branch of the Nile, near the apex of the Delta, and was one of the most ancient and important of Egyptian cities. It was the chief seat of the wisdom of the Egyptians, and Thales, Plato, and Solon are reported to have learnt from its priests. The obelisk called 'Cleopatra's needle,' taken in 1878 to England, and then brought to New York in 1880, was originally transported to Alexandria from this city.

Heliopolis, in Cœlosyria. See *Baalbek*.

Heliopsis (hē-li-op'sis), a genus of plants of the family *Asteraceæ*, comprising about seven species.

Heliophila (hē-li-of'i-la), a genus of plants of the family *Brassicaceæ*, consisting of about ten species of South African herbs or shrubs.

Heliornis (hē-li-or'nis), a genus of lobiped birds of the family *Helionorthidæ*, which comprises the sun-birds, sun-grebes, coot-grebes or finfoots. Also, in entomology, a genus of lepidopterous insects.

Helios (hē'li-os), the god of the sun (Latin, *Sol*) in the Greek mythology; son of Hyperion and Theia, and brother of Eos (Aurora, the dawn) and Selēnē (Luna, the moon). He dwells with Eos in the ocean behind Colchis, from which he issues in the morning, and to which he returns at night. His worship was extensively diffused, and he had temples in Corinth, Argos, Trœzene, and Elis, but particularly in Rhodes, the Colossus of which was a representation of Helios.

Helioscope (hē'li-u-skōp), a telescope fitted for viewing the sun without distressing the eyes, as when the image of the sun is received upon mirrors formed simply of surfaces

of transparent glass which reflect only a small portion of the light.

Heliostat (hē'li-u-stat). See *Heliograph.*

Heliotherapy (hēl-i-ō-ther'a-pi), the method of treating disease by exposing the naked body to the sun's rays. It has been found particularly helpful for tuberculosis of the bones, joints and ganglions, though it has been used with success in other diseases also, including acute rheumatism and even certain affections of the eye.

Heliotrope (hē'li-u-trōp), a genus of plants (*Heliotropium*), nat. order *Boraginaceæ*. The species are herbs or undershrubs, mostly natives of the warmer parts of the world, and have alternate leaves and small flowers usually disposed in scorpioid cymes. *H. Europæum*, the common heliotrope, is indigenous in the south and west of Europe and has small white or pale red flowers with a fruit of four drupes under a thin fleshy covering. The *H. Peruvianum* is a very fragrant garden plant, growing to about 2 feet in height and bearing small lilac-blue flowers.

Heliotrope (Jenny Lind variety).

Heliotrope, the bloodstone, a variety of quartz, partaking of the character of jasper or of chalcedony. It is of a deep green color, and covered with red spots. It is hard, and is used for burnishers; the more finely-marked stones are prized for seals, signet-rings, etc. It is found in Tartary, Persia, Siberia; in the island of Rum, Scotland, and elsewhere.

Heliotype (hē'li-u-tīp), a photographic process by which pictures can be printed in the same manner as lithographs, depending on the fact that a dried film of gelatine and bichromate of potash, when exposed to light, is afterwards insoluble in water, while the portion not so exposed swells when steeped. A mixture of gelatine, bichromate of potash, chrome alum, and water is poured on a plate of glass, where it shortly settles into a film. When dried the film contracts and separates from the glass. A picture is then printed on it from a negative, after which it is attached to a plate of zinc, and copies are taken from it by inking it with lithographic ink exactly as in the ordinary lithographic process. The films are technically called 'skins.' Sometimes a gutta-percha mold is prepared from the film, and copper deposited on it by the electrotype process, the plate thus produced being printed from in the ordinary way.

Helium (hē'li-um), a newly-discovered element, first found in the sun by its spectral lines, and so named from being supposed to be peculiar to that body. It was discovered on the earth in 1895 in the Norwegian mineral cleveite, and has since been found in various connections. It is supposed to be identical with the alpha ray given off by radium. Its atomic weight is double that of hydrogen.

Helix (hē'liks), (1) a spiral line as of wire in a coil, or such a curve as is described by every point of a screw that is turned round in a fixed nut. (2) In architecture, a small volute or twist under the abacus of the Corinthian capital, of which in every perfect capital there are sixteen, two at each angle, and two meeting under the middle of each face of the abacus.

Helices of Corinthian Capital.

Helix, a genus of gasteropodous molluscs, comprising the land shell-snails. The common garden snail (*H. hortensis*) and the edible snail of France (*H. pomatia*) are examples.

Hell (A. Saxon, *hel*, from *helan*, to cover), signifies originally the covered or invisible place. In the English Bible the word is used to translate the Hebrew *sheol* (grave or pit) and *Gehenna* (properly the valley of *Hinnom*), as well as the Greek *Hades* (the unseen). In the Revised Version of the New Testament, however, hell is used only to translate *Gehenna*, *Hades* being left where it stands in the Greek. In common usage hell signifies the place of punishment of the wicked after death, its earlier meaning being lost. The distinctive Scripture term for the place of future punishment of the wicked is Gehenna, which, unlike Sheol and Hades, never has an intermediate signification; and Christ adopting on this point the current language of the time gave the sanction of his authority to the leading ideas involved in it. Gehenna, or hell, is with him the place of final torment. The Eastern and Western churches are at one as to the punishment of hell being partly 'a pain of loss,' that is, the consciousness of being debarred the presence of God, and partly a 'pain

of sense,' that is, real physical suffering. The prevailing idea among modern theologians is that the 'fire' and the 'worm' are significant emblems to give us the most correct and living conceptions of the reality that we can possibly attain in our present circumstances.

Helladotherium (hel-a-do-ther'i-um), an extinct genus of ungulate quadrupeds allied to the existing giraffe. Fossil remains occur in the upper Miocene rocks of Attica.

Hellas, HELLENES. See *Greece.*

Hellbender, a popular name for the Menopome (which see).

Hellebore (hel'e-bōr; *Helleborus*), a genus of plants, nat. order Ranunculaceæ, consisting of perennial low-growing plants with palmate or pedate leathery leaves, yellowish, greenish, or white flowers, having five conspicuous persistent sepals, eight to ten small tubular petals, and several many-seeded carpels. *H. orientālis* is the species which produced the black hellebore of the ancients. *H. niger*, the Christmas-rose common in gardens, is a native of South and East Europe, and is the source of the black hellebore of modern pharmacopeias. The whole of these plants are accounted purgative, and in large doses act as a narcotic acrid poison; but they are now little used in medicine. *Veratrum album*, order Melanthaceæ, a very different plant, is known as white hellebore. It is extremely acrid, and in the form of powder is used to destroy caterpillars.

Black Hellebore or Christmas-rose (*Helleborus niger*).

Hellen (hel'en), in Greek mythology, son of Deucalion and Pyrrha, and founder by his three sons Dorus, Æolus, and Xuthus of the great branches of the Greek people or Hellenes.

Hellenists (hel'en-ists), a name for those Jews who, especially in Egypt after the time of Alexander the Great, became imbued with Greek culture and civilization, and spoke and wrote in Greek. To them was due the formation of the peculiar dialect termed the *Hellenistic* dialect of Greek, the special feature of which was its use of foreign, and more particularly of Hebrew and Aramaic words and idioms. The most noted of the Jewish Hellenistic philosophers was Philo of Alexandria, and the chief of the learned labors of the Alexandrian Jews was the Septuagint version of the Old Testament.

Hellespont. See *Dardanelles.*

Hell Gate, a formerly dangerous pass in East River, the strait which connects New York Bay with Long Island Sound. Rocks here used to form an obstruction much dreaded by mariners, but by extensive submarine mining operations the passage has been made safely navigable. Hell-gate bridge, which now spans it, is the longest of its type in the world, spanning over 1000 feet between its piers in Long Island and the Bronx. The arch intrados rises 260 feet above water and the deck is about 150 feet above river level, carries four railroad tracks, and affords continuous railroad passage from New York City to New England. It was opened in March, 1917.

Helm the contrivance by which a vessel is steered, usually composed of three parts, viz., the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. See *Steering Apparatus.*

Helmet (hel'met), an article of armor for the protection of the head, composed of leather or of metals. Some of Homer's heroes are represented as wearing brazen helmets, with towering crests. Among the Romans the *cassis* was a metallic helmet; the *galea*, a leathern one. The earlier Greek and Roman helmets did not protect the face. During the middle ages helmets were made of steel, frequently inlaid with gold, and provided with bars and flaps to cover the face in battle and to allow of being opened at other times. The full-barred helmet entirely covered the head, face, and neck,

Full-Barred Helmet.

Open Helmet.

having in front perforations for the admission of air, and slits through which the wearer might see the objects around him. The open helmet covered only the head, ears, and neck, leaving the face unguarded. Some open helmets had a bar or bars from the forehead to the chin, to guard against

the transverse cut of a broadsword. The modern military helmets afford no protection for the face. Firemen wear a heavy head-piece of leather and brass, or other materials, to protect them so far as possible from falling ruins at conflagrations. Helmets of white felt, with folds of linen wrapped round them, are worn in India and other hot climates as a protection against the sun. The name helmet is also given to a kind of hat worn by policemen. In *heraldry* the helmet is borne over a coat of arms, and the form and position of it vary according to the quality or dignity of the bearer. See *Heraldry*.

Helmet-shell, the common name of molluscous shells of the genus *Cassis*, gasteropods of the family Buccinidæ. Most of the species are inhabitants of tropical shores, but a few are found on the coast of the Mediterranean. Some of the shells attain a large size. Those of *C. rufa*, *C. cornuta*, *C. tuberosa*, and other species, are the material on which shell cameos are usually sculptured.

Helmholtz (helm'holts), HERMANN-LUDWIG FERDINAND, a German physiologist and physicist, born in 1821 at Potsdam, and educated at Berlin. In 1848 he became professor of anatomy at the Academy of Fine Arts, Berlin, and in 1849 he obtained the chair of physiology at Königsberg, from which he was successively transferred to the same post at Bonn (1855), and at Heidelberg (1858). In 1871 he was appointed professor of physics at Berlin. His work has been chiefly in those departments of physics which are in closest relation with physiology, notably in acoustics and optics. Of his many publications the best known are: *The Conservation of Force* (1847), *Manual of Optics* (1856-66), *Popular Lectures on Scientific Subjects* (London, 1873 and 1881), and *Sensations of Tone as a Physiological Basis for the History of Music* (1862, London 1875). He was ennobled by the German emperor in 1883. He died in 1894.

Helmont (hel'mont), JOHN BAPTIST VAN, born in 1577 at Brussels; in his seventeenth year gave public lectures on surgery at Louvain. Perceiving the defects of the system of Galen, he announced his intention of reforming medicine, but finally renounced its practice, and traveled for ten years. He was then induced by an empirical chemist to take up the study of chemistry, and his medical tastes reviving, he retired to Vilvorde, near Brussels, where he occupied himself till his death with medical labors. He boasted of having found the means of prolonging life, composed visionary theories on the constitution of man, and on diseases, and made some genuine discoveries in chemistry. He was probably the first to introduce the term *gas* into science, and was also first to observe the acid reaction of the gastric juice. The system of Van Helmont resembles that of Paracelsus, but is more clear and scientific. The emperors Rodolph II, Matthias, and Ferdinand II, invited him to Vienna, but he preferred the independence of his laboratory. He died in 1644, and his manuscripts were printed by Elzevir.

Helmstedt, or HELMSTADT (helmstet), a town in Brunswick, 20 miles E. S. E. of Brunswick; formerly a member of the Hanseatic League. There are a fine church of the twelfth century and buildings in the Romanesque style formerly accommodating a university abolished in 1809. Pop. 14,259.

Helmund (hel'mund), a river in Afghanistan, which it traverses diagonally northeast to southwest, and ultimately falls into the extensive Lake Hamoon, after a course of about 550 miles. Its source is 11,500 feet above sea-level.

Heloderma (hel-u-dêr'ma), a Mexican genus of lizards, of which one species at least, *H. horridum*, has been proved to be venomous, all its teeth being furnished with poison glands. It is about 3 ft. in length, has a thick and squat body covered with rough scales, forms burrows under the roots of trees, is nocturnal in habit, and is said to feed on insects, worms, millepeds, etc.

Héloise, ELOISE (ā-lō-ēz'), celebrated for her beauty and wit, but still more on account of her love for Abelard; was born in Paris in 1101. After the mutilation of her lover she was persuaded by him to take the veil at Argenteuil, and ultimately became prioress of the convent there until 1129, when she entered, with some of her nuns, the oratory of the Paraclete, built by Abelard at Nogent-on-the-Seine, where she lived in exemplary piety. She died in 1164. Contemporary writers speak in high terms of her genius. She understood Latin, Greek, Hebrew, was familiar with the ancients, and well read in philosophy and theology.

Helots (hel'ots), slaves in ancient Sparta. They were the property of the state, which alone had the disposal of their life and freedom, and which assigned them to certain citizens, by whom they were employed in private labors. Agriculture and all mechanical

arts at Sparta were in their hands, and they were also obliged to bear arms for the state in case of necessity. They behaved with great bravery in the Peloponnesian war, and were rewarded with liberty (431 B.C.), but 2000 appear to have been subsequently secretly massacred. They several times rose against their masters, but were always and finally reduced.

Helper (hel'pėr), HINTON ROWAN, author, born in Davie County, North Carolina, in 1829. He lived for a time in California and wrote *The Land of Gold.* He won great notoriety by his *The Impending Crisis of the South* (1857), an antislavery work which created a great sensation. Other works were *No-joque* and *Negroes in Negroland.* He was United States consul at Buenos Ayres, 1861-67, and died by suicide in 1909.

Helps, SIR ARTHUR, an English essayist and historian, born in 1817. He was graduated at Cambridge in 1835, and from 1859 until his death in 1875 was clerk of the privy-council. His works, which are for the most part of a pleasant moralizing type, with many indications of a fine, if not of a robust personality, comprise *Thoughts in the Cloister and the Crowd* (1835); *Catherine Douglas, a Tragedy* (1839); *Essays written during the Intervals of Business* (1841); *The Spanish Conquest of America* (1855-61); *Realmah, a Romance* (1868); *Ivan de Brion, a Russian Story* (1874), and various others. He also edited the Prince Consort's *Speeches* (1862), and the Queen's *Leaves from a Journal* (1868), receiving knighthood shortly before his death.

Helsingborg (hel-sing-bor'), a seaport in Sweden, at the narrowest part of the Sound, opposite Elsinore. It has manufactures of leather, dye-works, tile-works, salt-works, and a spacious harbor. Pop. 33,843.

Helsingfors (hel-sing-fors'), a seaport of Russia, capital of Finland, on a peninsula in the gulf of that name, 180 miles W. N. W. St. Petersburg. Helsingfors is the residence of the governor, the seat of important courts and public offices, and contains a university, removed from Abo in 1827. It has manufactures of linen, sail-cloth, and tobacco, an important trade in timber, corn, and fish, and one of the best harbors in the Baltic. Pop. (1910) 147,218.

Helsingör. See *Elsinore.*

Helst, BARTHOLOMEW VAN DER, a most distinguished Dutch portrait painter, born at Haarlem in 1611 or 1612. His picture of a banquet of a company of civic guard in the Stadthouse at Amsterdam was called by Sir Joshua Reynolds 'perhaps the first picture of portraits in the world.' He died at Amsterdam (where he had long resided) in 1670.

Helston (hel'stun), a borough of England, county of Cornwall, on an acclivity on the left bank of the Cober, 9 miles S. W. Falmouth. Principal industries, mining and shoemaking, and there is some shipping trade from Port Leven, 3 miles distant. Pop. 2938.

Helvellyn (hel-vel'lin), one of the highest mountains of England, county of Cumberland, between Keswick and Ambleside; height, 3315 feet.

Helvetian Republic (hel-vē'shun) the name given to the republic established in Switzerland by the French in 1798. See *Switzerland.*

Helvetic Confession (hel-vet'ik), the name of a document drawn up by Martin Bucer in 1536 to settle the controversy between the Lutherans and the Zwinglians; and also of one drawn up by Bullinger (1566) at the request of Friedrich III, elector of the Palatinate, and adopted in Switzerland, the Palatinate, France, Hungary, Poland, and Scotland.

Helvetii (hel-vē'shi), anciently a Gallic or Celtic nation, dwelling in the country now nearly corresponding with Switzerland. They were not much known to the Romans until the time of Julius Cæsar, who, as governor of Gaul, prevented their intended emigration, and after many bloody battles pressed them back within their frontiers. After their subjection by Cæsar several Roman colonies were established amongst them. On the death of Nero the Helvetii, for refusing to acknowledge Vitellius as emperor, were mercilessly punished by Cæcina, one of his generals, and thenceforth almost disappear as a people. From them Switzerland is often called Helvetia.

Helvétius (el-vā-si-ûs), CLAUDE ADRIEN, a French philosophical writer, born in 1715. Having made a fortune as a farmer-general, he devoted himself to philosophic work. In 1758 he published his one important book, *De l'Esprit* ('On the Mind'), the materialism of which drew upon him many attacks. It was condemned by the Sorbonne, and publicly burned by decree of the Parliament of Paris. In 1764 he went to England, and the year afterwards to Germany, where Frederick the Great and

other German princes received him with many proofs of esteem. He died in 1771 in Paris. He also wrote a work, *De l'Homme*, and an allegorical poem, *Le Bonheur*.

Helvoetsluis (hel'vut-slois). See *Hellevoetsluis*.

Hemans (hem'anz), FELICIA DOROTHEA, an English poetess, born at Liverpool in 1794; maiden name Brown. She first appeared as an authoress in 1808, with a volume entitled *Early Blossoms*, which was followed in 1812 by her more successful volume, *The Domestic Affections*. Later works were, *Lays of Many Lands*, *Songs of the Affections*, *Hymns for Childhood*, *National Lyrics*, etc. She died in 1835.

Hematin (hem'a-tin), or HÆMATIN, the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

Hematite (hem'a-tit), a name applied to two ores of iron, red hematite and brown hematite. They are both of a fibrous structure, and the fibers, though sometimes nearly parallel, usually diverge or even radiate from a center. They rarely occur amorphous, but almost always in concretions, reniform, globular, botryoidal, stalactitic, etc. The red hematite is a variety of the red oxide, and is one of the most important iron-ores. The brown hematite is a variety of the brown oxide or hydrate; its streak and powder are always of a brownish yellow. See *Iron*.

Hematoxylin. See *Hæmatoxylin*.

Hemeralopia (hem-er-a-lō'pi-a), a defect in the sight in consequence of which a person can see only by artificial light; day blindness. It is also used, however, for exactly the opposite defect of vision.

Hemerobiidæ (hem-er-o-bi'dē), the lace-wing flies, a family of neuropterous insects.

Hemerocallis (hem-er-o-kal'is), a genus of Liliaceæ. See *Day-lily*.

Hemidesmus (hem-i-des'mus), a genus of twining plants, nat. order Asclepiadaceæ, having opposite leaves, and cymes of small greenish flowers. *H. indicus* yields the Indian sarsaparilla, a reputed alterative, diuretic, and tonic, which is rarely employed in England.

Hemimetabola (-me-ta-bō'la), the section of the class Insecta which undergo an incomplete metamorphosis, the larva differing from the perfect insect chiefly in the absence of wings and in size.

Hemiopia (-ō'pi-a), a defect of vision in which the patient sees only a part of the object he looks at, the middle of it, its circumference, or its upper or lower part, or more commonly one lateral half being completely obscured. Also called *hemianopsia*.

Hemiplegia (-plē'gi-a), HEMIPLEGY, a paralysis affecting one-half of the body.

Hemipodius (-pō'di-us), a genus of rasorial birds allied to the quails. The swift-flying hemipodius is the little quail of New South Wales.

Hemiptera (he-mip'tĕr-a), an order of four-winged insects, having a suctorial proboscis, the outer wings, or wing-covers, either entirely formed of a substance intermediate between the elytra of beetles and the ordinary membranous wings of most insects, or leathery at the base and transparent towards the tips (*hemelytra*). In one group (Aphides) all the wings when present are membranous. The true wings are straight and unplaited. Some feed on vegetable and some on animal juices. Those having the upper wings of a uniform substance throughout (whether leathery or transparent) have been constituted into a section, and by some naturalists into an order named Homoptera; those having them partly leathery and partly transparent constitute the section or order Heteroptera. To the Hemiptera belong the plant-lice, boat-fly, cochineal insect, locust, bug, lantern-fly, etc.

Hemisphere (hem'is-fēr), half a sphere, especially one of the halves into which the earth may be supposed to be divided. It is common to speak of the Eastern Hemisphere and the Western Hemisphere, the former, also called the Old World comprising Europe, Asia, Africa, Australia, etc.; the latter, North and South America, etc. The boundary between the two is quite arbitrary, and a more natural division of the earth is into the northern and the southern hemisphere, the equator forming the dividing line.

Hemlock, or HEMLOCK SPRUCE, a name given to an American fir (*Abies Canadensis*) from its branches resembling in tenuity and position the common hemlock. The bark contains tannin and is largely used as a substitute for oak-bark in tanning leather. It forms great part of the forests of Canada and of the northern United States, extending northward to Hudson Bay. Its timber is not much esteemed.

as it splits obliquely and decays rapidly in the atmosphere.

Hemlock (hem-lok), a poisonous plant, *Conium maculātum*, nat. order Umbelliferæ, supposed to be identical with the plant *kōneion* of the Greeks. It is a tall, erect, branching biennial, with a smooth, shining, hollow stem, usually marked with purplish spots, elegant, much divided leaves, which when bruised emit a nauseous odor, and white flowers in compound umbels of ten or more rays, surrounded by a general involucre of three to seven leaflets. It is found throughout Europe and temperate Asia and in the United States, in waste places, banks, and under walls. It is said to be fatal to cows when they eat it, but that horses, goats, and sheep may feed upon it without danger. In the human subject it causes paralysis, convulsions, and death. The poison administered to Socrates is supposed to have been a decoction of it, though others are of opinion that the potion was obtained from water-hemlock (*Cicūta virōsa*). Hemlock is a powerful sedative, and is used medicinally. The alkaloid, coniine, is considered the best preparation. It is often serviceable as a substitute for, or an accompaniment to, opium.

Hemlock (*Conium maculatum*).

Hemorrhage (hem'u-rij), a flux of blood from the vessels containing it, whether from a rupture or any other cause. A hemorrhage from the lungs is called *hemoptysis;* from the urinary organs, *hematuria;* from the stomach, *hematemesis;* from the nose, *epistaxis;* the treatment of course varying with the cause and seat of the mischief.

Hemorrhoids (hem'u-roidz), signifying an affection of the rectum otherwise called *piles*. In general, hemorrhoids manifest themselves between the period of puberty and old age, although infants and aged people are not entirely exempt from attacks. In some cases they appear to be the effect of a certain hereditary disposition, but any circumstance which produces a tendency or stagnation of the blood at the extremity of the rectum is to be reckoned among the local causes. The accumulation of fecal matter in the intestines, efforts to expel urine, the obstruction of any of the viscera, especially of the liver, the frequent use of hot bathing, of drastic purges, long continuance in a sitting posture, riding on horseback, pregnancy—such are some of the ordinary causes of hemorrhoids. They are classified in several varieties as external, when apparent at the anus; internal, when concealed within the orifice; blind or open, regular or irregular, active or passive, periodical or anomalous, etc. The best mode of treatment is to recur to hygienic rather than medicinal influences. The subject should avoid violent exercise; the food should not be too stimulating or nutritious. Traveling, or an active life, should succeed to sedentary habits. Constipation should be remedied by laxatives or gentle purgatives. Anything which may be productive of a local heat should be avoided; as warm seats, soft beds, too much sleep. If the pain is considerable recourse should be had to sedatives, gentle bleeding, leeches. The use of suppositories containing drugs, such as tannic acid or extract of witch-hazel (hazeline), will be found very useful; in mild cases iodoform suppositories may be curative. If the disease appears under a more severe form a surgical operation may become necessary.

Hemp (*Cannābis satīva*), a plant, the only known species of the genus *Cannābis*, nat. order Cannabinaceæ. It is an annual herbaceous plant; the leaves are divided into five lanceolate and coarsely serrate leaflets; the male flowers, which are on separate stems, are green, resembling those of the hop; the female flowers are inconspicuous, and the fruit is a little hard capsule containing a single seed. It is a native of Western and Central Asia, but has long been naturalized in Brazil and tropical Africa, and is extensively cultivated in Italy and many other European countries, particularly Russia and Poland. The Indian variety, often known as *Cannābis Indica*, is the source of the narcotic drug variously known as *hashish, bhang*, or *gunjah*. The hemp fiber is tough and strong, and peculiarly adapted for weaving into coarse fabrics such as sailcloth, and for twisting into ropes and cables. Immense quantities are exported from Russia. The finer sorts are used for shirtings, sheetings, etc., which, though coarser than that made from flax, are very

Hemp (*Cannābis satīva*).

much stronger and equally susceptible of being bleached. The hemp of England is very superior, but the plant does not pay the farmer, and very little of it is grown. In some of the United States it is a crop of considerable importance. The seed must be sown thin, not more than 1 to 2 bushels to an acre. Small paths are often left open along the field lengthwise, at about 7 feet distance from each other, to allow the plucking of the male plants first, as the female require to remain standing a month longer to admit of the seed becoming ripe. But in some parts the whole crop is cut at once, plants for seed being separately cultivated. The plant being stripped of its leaves, and dried in the open air, may be stored, but when steeped green it turns out of a better color. The steeping takes from four to eleven days, and the operation is known to be completed by the inner *reed* or woody fiber separating easily from the fibers of the outer bark. When thoroughly steeped it is taken out of the water and spread out in rows on the grass to bleach. This takes three weeks or more, during which period it requires constant turning with a light, long pole. After drying it is scutched or broken by breaks and scutching-stocks, resembling those employed for flax. Beating is the next operation, which separates the 'boon' from the fiber. The hemp is now ready for being heckled, after which it may be spun. Hemp-seed is much used as food for cage-birds, and also yields an oil. Sisal hemp or (henequen) and Manila hemp are not true hemps.

Hemp-palm, a Chinese and Japanese species of palm (*Chamærops excelsa*), of the fibers of whose leaves cordage is made.

Hempstead, a residential village of New York, on Long Island, 20 miles E. of New York. Pop. (1920) 6382. Hempstead town includes Cedarhurst, Freeport, Garden City, Hempstead, Lawrence, Long Beach, Lynbrook, Rockville Center, Woodsburgh, East Rockaway, and part of Floral Park.

Hems, or HOMS (Roman, *Emesa*), a town of Syria, 85 to 90 miles northeast of Damascus. It is fortified, and has an active trade. The plains of Hems were the scene of the defeat of Zenobia by Aurelian in 272 A.D.; and of the defeat of the forces of the Sultan of Turkey by Ibrahim Pasha in 1832. Pop. estimated 66,000.

Henbane (hen'bān), a plant of the genus *Hyoscyămus*, nat. order Solanaceæ. *H. niger*, a native of Europe and Northern Asia, is a coarse, erect biennial herb. found in waste ground and loose dry soil, having soft, clammy, hairy foliage of disagreeable odor, pale yellowish-brown flowers streaked with purple veins, and a five-toothed calyx. The expressed juice of the leaves and seeds is often used as a sedative, antispasmodic, and narcotic, having in many cases the great advantage over laudanum of not producing constipation. When taken in considerable quantity it proves quickly fatal to man and most animals, particularly to domestic fowls.

Henbane (*Hyoscyămus niger*).

Henderson, a city, county seat of Henderson Co., Kentucky, on the Ohio River, 143 miles W. of Louisville. It is a large corn and tobacco market with excellent shipping facilities. It is the second city in the U. S. in the manufacture of buggies, and has coal mines, tobacco factories, packing plants, elevators, etc. Pop. (1920) 12,169.

Henderson, a city, county seat of Vance Co., North Carolina, 38 miles N. by E. of Raleigh, in the center of the Golden Leaf Tobacco Belt. It has yarn, hosiery and cotton bagging mills, buggy factories, etc. Pop. 5222.

Hendricks, THOMAS A. (1819-85), an American politician, born in Ohio. He studied law and practised in Indiana. He was governor of Indiana 1873-77. He was a candidate for the Vice-Presidency, with Tilden, in 1876; elected Vice-President, with Cleveland, in 1884, but died Nov. 25, 1885.

Heney, FRANCIS JOSEPH, lawyer, born at Lima, New York, in 1859. He graduated at the University of California and the Hastings Law School, was admitted to the bar in 1883, engaged in legal and other occupations in Arizona, and was attorney-general of Arizona, 1893-94. He removed to San Francisco in 1895, and was later chosen by Attorney-General Knox to conduct cases of fraudulent land dealings at Portland, Oregon. In these he secured the removal from office of United States Attorney John H. Hall for conspiracy, and the conviction for fraud of United States Senator Mitchell, George C. Brownell, and others. He served for a time as United States District Attorney for Oregon, and in 1906

began an investigation of the wholesale corruption then existing in San Francisco. He succeeded in proving great bribery and graft, in which a party leader named Reuf and Mayor Eugene Schmidt were deeply involved. During their trials Heney was shot by a saloonkeeper, but recovered and continued his cases.

Hengist (heng'gist), a prince of the Jutes. In 449 the Britons sued for aid from the Saxons against the inroads of the Scots and Picts. The Saxons under Hengist and Horsa accordingly landed at the mouth of the Thames, and defeated the northern tribes near Stamford in 450 A. D. Being reinforced from home they afterwards united with the Scots and Picts against the Britons, whom they ultimately dispossessed. Hengist founded the kingdom of Kent, established his residence in Canterbury, and died about the year 488.

Hengstenberg (heng'sten-burg), Ernst Wilhelm, a German divine and commentator, born in 1802; died in 1869. His influence as leader of the orthodox party was established by the publication of the *Evangelische Kirchenzeitung* (1827), of which he was editor. His works include a translation of Aristotle's *Metaphysics; Christology of the Old Testament*, and *Introduction to the Old Testament; Commentary on the Psalms, the Revelation of St. John; History of the Kingdom of God in the Old Testament*, etc.

Hen-harrier, a species of hawk of the genus *Circus*, *C. cyaneus*. See *Harrier*.

Henley, William Ernest, an English poet, born at Gloucester, England, 1849; died, 1903. With Robert Louis Stevenson he collaborated in a series of plays; also edited *The Magazine of Art*, *The Scots* (later *National*) *Observer*, *The New Review*, and other serials; two or three anthologies of lyrics, etc. His poetry is vigorous and vivid and shows a fondness for unrhymed lyrical measures and experiments in unusual rhymes. A collected edition of his poems appeared in 1898; but *For England's Sake* (1900) and *Hawthorn and Lavender* (1901) were later volumes.

Henley-on-Thames, a municipal borough of England, in Oxfordshire, on the left bank of the Thames, here crossed by a handsome bridge, 35 miles west of London. Pop. 6456.

Henna (hen'a), a shrub (*Lawsonia inermis*), nat. order Lythraceæ, bearing opposite entire leaves and numerous small white fragrant flowers disposed in terminal panicles. Externally it bears considerable resemblance to the European privet. It grows in moist situations throughout North Africa, Arabia, Persia, and the East Indies, and has acquired celebrity from being used by the inhabitants of those countries to dye yellow the nails of their fingers and the manes, hoofs, etc., of their horses.

Hennepin (hen'i-pin), Louis, French Franciscan missionary and explorer in America, born at Ath, Belgium, about 1640; died after 1701. He went to Canada in 1673 and in 1678 joined La Salle, then starting on his most famous expedition, and from Fort Crèvecœur (near the present Peoria, Ill.) was despatched with two companions, to explore the Illinois to its mouth, and the upper Mississippi. On April 11, 1680, he was captured by a band of Sioux Indians, probably near the mouth of the Wisconsin River, and was adopted into the tribe; during his captivity visited, probably first of white men, the Falls of St. Anthony, and escaping returned to Fort Frontenac (1681). Soon afterward he returned to France, and in 1683 published his famous book *Description de la Louisiane* (1683), *Nouvelle découverte d'un très grand pays* (1697), in which he claimed to have descended the Mississippi to its mouth (a claim since shown to be false), and *Nouveau voyage* (1698).

Henry I, of Germany, surnamed *The Fowler*, according to tradition because his election to the German empire was announced to him while fowling; born in 876; the son of Otho the Illustrious, duke of Saxony. Henry, on the death of his father, became duke of Saxony and Thuringia. He was elected emperor of Germany in 919, and was the true founder of the empire. By his prudence and activity Suabia and Bavaria were forced to tender allegiance, and Lorraine was reunited to the German Empire in 925. He was defeated, however, by the Hungarians, and forced to pay a yearly tribute to obtain a truce for nine years. He spent this period in developing a sound military organization, and turning his arms against various Slavonic tribes in the south, was everywhere victorious. At the end of the truce with the Hungarians he refused the tribute, and completely routed them in 933. Besides his military reforms he diminished the feudal privileges, and granted to the cities of the empire their first municipal charters. He died in 936.

Henry II, the Saint, Emperor of Germany, born in 972, was a son of Henry the Quarreler of Ba-

varia, and great-grandson of the Emperor Henry I. He inherited Bavaria in 995, and on the death of Otho III in 1002 laid claim and was elected to the empire. He had to proceed to Italy to assert his sovereignty there, the Lombard cities having chosen Harduin of Ivrea as their king. During his absence Boleslas of Poland extended his sway over the whole of Bohemia, but after repeated campaigns Henry succeeded in recovering Bohemia, and in 1018, in the Peace of Budissin (Bautzen), reduced him to complete subjection. In the midst of these campaigns against Boleslas he made another expedition into Italy (1013) against Harduin. On this occasion Henry was crowned emperor by Pope Benedict VIII. He made a third expedition into Italy in 1022 to aid Benedict against the Greeks. He died in 1024.

Henry III, Emperor of Germany, the second belonging to the house of the Salian Franks, son of the Emperor Conrad II, was born in 1017; chosen king in 1026; succeeded his father in the imperial dignity, in 1039. He weakened the power of the great feudal lords and forced the duke of Bohemia in 1042, and the king of Hungary in 1044, and again in 1047, to accept their dominions as imperial fiefs. His influence was also paramount in Italy, especially in Milan, and in the south, where the Normans in Apulia and Calabria paid him homage. In 1046 he deposed the rival popes Benedict IX, Sylvester III, and Gregory IV, and caused Suitger, bishop of Bamberg, to be elected in their stead as Clement II. His efforts to secure the permanence of the influence of the empire over the see of Rome were thwarted by Cardinal Hildebrand (Gregory VII). He died in 1055. His first wife was a daughter of Canute the Great of England.

Henry IV, Emperor of Germany, son of Henry III, was born in 1050, and at the death of his father was only five years old. His whole life was a series of troubles, partly of his own causing. His severe treatment of the Saxons led to a rising which was cruelly punished. His treatment of the conquered people was such that they complained to the pope, and Gregory VII (Hildebrand) accordingly summoned Henry, in 1076, to appear before him at Rome and answer the charges, at the same time forbidding the sale of ecclesiastical dignities. Henry not only disregarded the threat, but instigated the bishops, assembled by his order at Worms, to renounce their obedience to the pope. Gregory, however, pronounced sentence of excommunication against him, and Henry, finding himself deserted, was obliged to go to Italy and make a humiliating submission to the pope (1077). The influence which the pope gained by his victory produced a reaction; the Italian princes who had long been dissatisfied with Gregory, offered Henry their assistance. The German princes, however, at the instigation of the pope, elected Rudolph, duke of Suabia, king. Henry hastened back to Germany and overcame his rival, who lost his life in 1080. Gregory again excommunicated Henry; but at the Council of Brixen, in 1080, he was deposed by the German and Italian bishops as a heretic and a sorcerer, and Guibert, archbishop of Ravenna (Clement III) set up in his place. In 1084 Henry succeeded in establishing Clement at Rome, but was obliged to return to Germany to maintain his obliged to cross the Alps in aid of his ground against two rivals who successively arose. In 1085 Henry was again protégé Clement III. But the dissatisfaction against him in Germany had not subsided, and though he succeeded in crushing the rebellion of his eldest son, Conrad, who died deserted at Florence in 1101, his second son Henry made himself master of his father's person in 1105 by stratagem, and compelled him to abdicate the throne at Ingelheim. Henry IV ended his life and his sorrows in neglect at Liége in 1106.

Henry V, Emperor of Germany, the son and successor of Henry IV (see above), was born in 1081. On his ascension the question of investiture distracted the empire anew. Pope Pascal would confer the imperial crown only upon condition that the rights claimed by Gregory should be formally conceded. Henry therefore seized the pope at the altar, and imprisoned him until he yielded two months later, and crowned Henry in April, 1118. Disturbances, however, arose in Germany, especially with Lothaire of Saxony, and the pope, declaring that his peace with the emperor had been compulsory, fomented the strife. The war continued two years, and devastated Germany, and after a second expedition to Italy and excommunication by successive popes, Henry was compelled to yield in the matter of investiture, and in 1122 subscribed the Concordat of Worms. He died at Utrecht in 1125, and was the last of the Salic or Frankish family of emperors, which was succeeded by the Suabian house. He married Matilda, a daughter of Henry I of England.

Henry VI, Emperor of Germany, son of Frederick I and Beatrice of Burgundy, the third emperor of the house of Hohenstaufen, born in

1165, crowned king in 1169, succeeded his father as emperor in 1190. He kept Richard Cœur du Lion in prison, and obtained a large ransom for him. He died in 1197.

Henry VII, Emperor of Germany, born in 1262, was chosen emperor in 1308. Among the first acts of his reign were recognition of the independence of the Swiss cantons of Schwyz, Uri, and Unterwalden, and the granting of the kingdom of Bohemia to his son John. He compelled the Milanese to give him the iron crown of Lombardy, suppressed by force the revolt which then broke out in Upper Italy, captured part of Rome, which was in the hands of Neapolitan troops, and was crowned Roman Emperor by two cardinals. He died suddenly in 1313.

Henry II, King of France, born in 1519, succeeded his father, Francis I, in 1547. Throughout his reign his mistress, Diana of Poitiers, exercised an important influence over king and court. After a brief war with England for the recovery of Boulogne, a war of longer duration and more serious results originated in 1551 in disputes between Henry and the pope as to the duchies of Parma and Placentia, and continued to devastate Europe till the general peace of Câteau-Cambrésis, 1559. To confirm the peace Philip II, become a widower by the death of Mary of England, was to marry Elizabeth, Henry's eldest daughter by Catharine de Medici. In the course of a tourney held to celebrate the event, Henry was mortally wounded by a splinter from the lance of Lord Montgomery, captain of the Scottish guard. He was succeeded in 1559 by his eldest son, Francis II.

Henry III, King of France, third son of Henry II and Catharine de Medici, born in 1551; succeeded his brother, Charles IX, in 1574. In the previous year he had been chosen king of Poland, which he was obliged to quit secretly when called to the throne of France. In 1576, after a civil war, he granted to the Protestants the favorable edict of Beaulieu, but the concession led to the formation of the League, and Henry, to re-establish his authority, declared himself its head. Civil war, however, again broke out, and though hostilities were again put an end to by the Peace of Bergerac in 1577, they were renewed in 1580 until the Peace of Fleix (November, 1580). The death of his brother the Duc d'Anjou in 1584, which left Henry of Navarre, a Calvinist, heir-apparent to the throne, brought on another war, called the war of the Three Henries, the leading persons engaged in it besides the king being Henry of Guise, the real head of the League, and Henry of Navarre. In 1588 Henry of Guise expelled the king from his capital. An apparent reconciliation at Blois was followed by the assassination of the Guises, and Henry, finding himself everywhere opposed by the Catholic party, was compelled to ally himself with Henry of Navarre. The two princes advanced on Paris, but in 1589 Henry III was stabbed by Jacques Clement, a Dominican, and died next day. He was the last of the branch of Orléans-Angoulême of the stock of the Valois, and was succeeded by Henry of Navarre, the first of the house of Bourbon.

Henry IV, of France was the son of Anthony of Bourbon, Duke of Vendôme, and of Jeanne d'Albert, daughter of Henry, King of Navarre, and herself afterwards Queen of Navarre. He was born in December, 1553, at Pau. Educated by his mother in the Calvinistic faith, he early joined, at her wish, the Protestant army of France, and served under Admiral Coligny. In 1572 he married Margaret of Valois, sister of Charles IX, and after the massacre of St. Bartholomew, which took place during the marriage festivities, was forced to adopt the Catholic creed. In 1576 he escaped from Paris, retracted at Tours his enforced abjuration of Calvinism, put himself at the head of the Huguenots, and took a leading part in all the subsequent religious wars. On becoming presumptive heir to the crown in 1584 he was obliged to resort to arms to assert his claims. In 1587 he defeated the army of the League at Coutras, and after the death of Henry III gained the battles of Arques (1589) and Ivri (1590). He was obliged, however, to raise the siege of Paris; and convinced that a peaceful occupation of the throne was impossible without his professing the Catholic faith, he became nominally a Catholic in 1593. After his formal coronation in 1594 only three provinces held out against him—Burgundy, reduced by the victory of Fontaine-Française in 1595; Picardy, reduced by the capture of Amiens in 1596; and Brittany, which came into his hands by the submission of the Duke of Mercœur in the spring of 1598. The war against Spain was concluded in 1598 by the Peace of Vervins to the advantage of France. The same year was signallized by the granting of the edict of Nantes, which secured to the Protestants entire religious liberty. He made use of the tranquillity which followed to restore the internal prosperity of his kingdom, and particularly the wasted finances, in which he was successful with the aid

of his prime-minister Sully. At the instance of Sully Henry divorced Margaret of Valois, and in 1600 married Marie de Medici, niece of the Grand-duke of Tuscany, mother of Louis XIII. She was crowned at St. Denis in 1610, but on the following day Henry was stabbed by a fanatic named Ravaillac, while examining the preparations for the queen's entry into Paris. The great benefits which Henry IV bestowed upon France entitle him to the designation which he himself assumed at an assembly of the Notables at Rouen in 1596, the Regenerator of France (*Restaurateur de la France*).

Henry I, King of England, surnamed *Beauclerc* ('fine scholar'), youngest son of William the Conqueror, was born at Selby in Yorkshire, in 1068. He was hunting with William Rufus when that prince was killed, in 1100, and instantly riding to London, caused himself to be proclaimed king, to the prejudice of his elder brother Robert, then absent as a Crusader. He re-established by charter the laws of Edward the Confessor, recalled Anselm to the primacy, and married Matilda, daughter of Malcolm III of Scotland, thus conciliating in turn the people, the church, and the Scots. Robert landed an army, but was pacified with a pension, and the promise of succession in event of his brother's decease. Soon after, however, Henry invaded Normandy, took Robert prisoner in 1106, and reduced the duchy. He was successful also in the struggle with France. The last years of his reign were very troubled. In 1120 his only son William was drowned in returning from Normandy, where, three years later, a revolt occurred in favor of Robert's son. The Welsh also were a source of disturbance. Henry appointed as his heir his daughter Matilda or Maud, whom he had married first to the Emperor Henry V, and then to Geoffrey Plantagenet of Anjou. Henry died at Rouen in 1135, and was succeeded by Stephen.

Henry II, King of England, first of the Plantagenet line, born in Normandy in 1133, was son of Geoffrey, count of Anjou, and Matilda, daughter of Henry I. He was invested with the duchy of Normandy, by the consent of his mother, in 1150; in 1151 he succeeded to Anjou and Maine, and by a marriage with Eleanor of Guienne gained Guienne and Poitou. In 1152 he invaded England, but a compromise was effected, by which Stephen was to retain the crown, and Henry to succeed at his death, which took place in 1154. The commencement of his reign was marked by the dismissal of the foreign mercenaries; and although involved with his brother Geoffrey, who attempted to seize Anjou and Maine, and in a temporary dispute with France, he reigned prosperously till the contest with Thomas Becket regarding the Constitutions of Clarendon. Although sufficiently submissive after Becket's death in the way of penance and expiation, Henry gave up only the article in the Constitutions of Clarendon which forbade appeals to the court of Rome in ecclesiastical cases. Before this matter was terminated, Henry, in 1171, completed the conquest of Ireland, a great part of which had been reduced by Richard de Clare, Earl of Pembroke, commonly known as Strongbow. Henry's last years were embittered by his sons, to whom he had assigned various territories. The eldest son, Henry, who had been not only declared heir to England, Normandy, Anjou, Maine, and Touraine, but actually crowned in his father's lifetime, was induced by the French monarch to demand of his father the immediate resignation either of the kingdom of England or of the dukedom of Normandy. Queen Eleanor excited her other sons, Richard and Geoffrey, to make similar claims; Louis and William of Scotland gave them support; and a general invasion of Henry's dominions was begun in 1173 by an attack on the frontiers of Normandy, and an invasion of England by the Scots, attended by considerable disturbance in England. Conciliating the church by his penance, Henry took prompt action; William of Scotland was captured, and an accommodation arrived at with Henry's sons. These, however, once more became turbulent, and though the deaths of Henry and Geoffrey reduced the number of centers of disturbance, the king was forced to accept humiliating terms from Richard and Philip of France. He died shortly after at Chinon in 1189. He ranks among the greatest English kings both in soldiership and statecraft. He partitioned England into four judiciary districts, and ap-

Henry II, from his tomb.

pointed itinerant justices to make regular excursions through them; revived trial by jury, discouraged that by combat, and demolished all the newly erected castles as 'dens of thieves.'

Henry III, King of England, son of John by Isabel of Angoulême; born at Winchester in 1207; succeeded his father in 1216. At the time of his accession the dauphin of France, Louis, at the head of a foreign army, supported by a faction of English nobles, had assumed the reins of government; but was compelled to quit the country by the Earl of Pembroke, who was guardian of the young king until 1219. As Henry approached manhood he displayed a character wholly unfit for his station. He discarded his most able minister Hubert de Burgh, and after 1230, when he received homage in Poitou and Gascony, began to bestow his chief favors upon foreigners. His marriage in 1236 with Eleanor of Provence, increased the dislike to him felt by his subjects, and although he received frequent grants of money from parliament, on condition of confirming the Great Charter, yet his conduct after each ratification was as arbitrary as before. At length the nobles rose in rebellion under Simon de Montfort, earl of Leicester and husband of the king's sister; and in 1258, at a parliament held at Oxford, known in history as the Mad Parliament, obliged the king to sign the body of resolutions known as the Provisions of Oxford. A feud arose, however between Montfort and Gloucester, and Henry recovered some of his power. War again broke out, and Louis was called in as arbitrator, but his award being favorable to the king, Leicester refused to submit to it. A battle was fought near Lewes, in which Henry was taken prisoner. A convention, called *the Mise of Lewes*, provided for the future settlement of the kingdom; and in 1265 the first genuine House of Commons was summoned. Leicester, however, was defeated and slain in the battle of Evesham (1265), and Henry was replaced upon the throne. He died in 1272. His son Edward I succeeded him.

Henry IV, King of England, first king of the house of Lancaster; born in 1367; eldest son of John of Gaunt, duke of Lancaster, fourth son of Edward III. His mother was heiress of Edmund, earl of Lancaster, second son of Henry III. In the reign of Richard II he was made earl of Derby and duke of Hereford, but having in 1398 preferred a charge of treason against Mowbray, duke of Norfolk, he was banished with his adversary. On the death of John of Gaunt in 1399 Richard withheld Henry's inheritance, and Henry, landing in England, gained possession of Richard's person. The deposition of Richard by parliament, and the election of Henry, was followed by the murder of the late king. A plot against the king in 1400 was discovered in time to prevent its success, and many executions of men of rank followed; but an insurrection in Wales under Owen Glendower proved more formidable. The Scots were decisively defeated by the Percies at Homildon, and their leader, the Earl of Douglas, was captured (1402). An order from Henry not to permit the ransom of that nobleman and other Scottish prisoners was regarded as an indignity by the Percies, who set Douglas free, made an alliance with him, and joined Glendower. The king met the insurgents at Shrewsbury (1403), the battle ending in the defeat and death of Percy. The Earl of Northumberland was pardoned, and but few victims were executed. A new insurrection, headed by the Earl of Nottingham and Scrope or Scroop, archbishop of York, broke out in 1405, but was suppressed by the king's third son, Prince John. The rest of this king's reign was comparatively untroubled. In 1405 James, son and heir to King Robert of Scotland, was captured at sea on his way to France, and was detained a prisoner in England. Henry died in 1413, and was succeeded by Henry V.

Henry V, King of England, born at Monmouth in 1388. On succeeding his father, Henry IV, in 1413, he showed a wisdom in marked contrast to a somewhat reckless youth. He restored their estates to the Percies, and liberated the Earl of March, but in other respects based his internal administration upon that of his father. The persecution of the Lollards is the chief blot upon the early part of his reign. The struggle in France between the factions of the dukes of Orleans and Burgundy afforded Henry a tempting opportunity for reviving the claims of his predecessors to the French crown. He accordingly landed near Harfleur in August, 1415, and though its capture cost him more than half his army he decided to return to England by way of Calais. A large French army endeavored to intercept him at the plain of Agincourt, but was completely routed (October, 1415). A year later the French were defeated at sea by the Duke of Bedford. In 1417 the liberal grants of the Commons enabled Henry once more to invade Normandy with 25,000 men. The assassination of the Duke of Burgundy, which induced his son and successor to join Henry,

greatly added to his power, and the alliance was soon followed by the famous Treaty of Troyes (May 21, 1420), by which Henry engaged to marry the Princess Catharine, and to leave Charles VI in possession of the crown, on condition that it should go to Henry and his heirs at his decease. He returned in triumph to England, but on the defeat of his brother, the Duke of Clarence, in Normandy by the Earl of Buchan, he again set out for France, drove back the army of the dauphin, and entered Paris. A son was at this time born to him, and all his great projects seemed about to be realized when he died of fever at Vincennes in August, 1422, at the age of thirty-four, and in the tenth year of his reign. He was succeeded by his son Henry VI.

Henry VI, King of England, born at Windsor in 1421, was crowned at Westminster in 1429, at Paris in 1430. As he was an infant not nine months old at the death of his father Henry V, his uncle John, duke of Bedford, was appointed regent of France; and his uncle Humphrey, duke of Gloucester, made protector of the realm of England. A few weeks after Henry's succession Charles VI of France died, when, in accordance with the Treaty of Troyes, Henry was proclaimed king of France. The war which followed at first proved favorable to the English, but in the end, by the heroism of Joan of Arc the death of the Duke of Bedford, and the defection of the Duke of Burgundy, resulted in the loss to the English of all their possessions in France except Calais. In April, 1445, Henry married Margaret of Anjou, daughter of René of Provence Two years later Humphrey of Gloucester died, when the Earl of Suffolk acquired the chief power in the kingdom, but his government was very unpopular. The insurrection of Cade followed, and the Duke of York returning from Ireland, a great party was formed in his favor, and he was declared by Parliament protector of the kingdom, the imbecile Henry being by this time unable even to personate majesty. The appointment was annulled in the following year, the king having recovered his faculties. York retired to the north, and being joined by his adherents, marched upon London. He encountered and defeated the king's army at St. Albans (1455), the first battle of the thirty years' wars of the Roses. The king again becoming deranged, York was once more made protector. Four years of peace followed, but the struggle was soon renewed. The king's forces were beaten at Blore Heath and Northampton, and though they gained the Battle of Wakefield, at which York was killed, they were again defeated by his son Edward at Towton and Hexham. Henry was restored for a few months in 1471 by Warwick, 'the king-maker,' but the battles of Barnet and Tewkesbury proved the hopelessness of his cause, and he died, some say was murdered, a few days after the last battle, in May, 1471. He was a gentle, pious, well-intentioned, hopelessly incompetent king, whose best reputation is that of founder of Eton College and King's College, Cambridge.

Henry VII, King of England, first sovereign of the race of Tudor, born in 1456. He was the son of Edmund, earl of Richmond, son of Owen Tudor and Catharine of France, widow of Henry V. His mother, Margaret, was the only child of John, duke of Somerset, grandson of John of Gaunt. After the battle of Tewkesbury he was carried by his uncle, the Earl of Pembroke, to Brittany, and on the usurpation of Richard III was naturally turned to as the representative of the house of Lancaster. In 1485 he assembled a small body of troops in Brittany, and having landed at Milford Haven, defeated Richard at Bosworth, and was proclaimed king on the field of battle, his right being subsequently recognized by parliament. In 1486 he married Elizabeth, daughter of Edward IV and heiress of the house of York, and thus united the claims of the rival houses of York and Lancaster. The reign of Henry VII was troubled by repeated insurrections, of which the chief were that headed by Lord Lovel and the Staffords (1486), and the impostures of Lambert Simnel (1487) and Perkin Warbeck (1496-99). He brought about a match between the Infanta Catharine, daughter of Ferdinand of Aragon and of Isabella of Castile, and his eldest son Arthur; and on the death of the latter, in order to retain the dowry of this princess, he caused his remaining son Henry to marry the widow by papal dispensation, an event which, in the sequel, led to a separation from the see of Rome. He married his eldest daughter to James IV, king of Scotland, from which marriage there ultimately resulted the union of the two crowns. In his later years his avarice became increasingly marked, two exchequer judges, Empson and Dudley, being employed in all sorts of extortion and chicanery in order to gratify this passion. His reign, however, was in the main beneficent. Its freedom from wars permitted the development of the internal resources of the country. His policy of depressing the feudal nobility, which proportionably exalted the middle ranks, was highly salutary. For a time,

however, the power lost by the aristocracy gave an undue preponderance to that of the crown. Henry died at Richmond in 1509.

Henry VIII, King of England, son of the preceding, born in 1491, succeeded his father in 1509. He was soon prevailed upon to join in a league formed against Louis XII of France. Some campaigns in France followed, but the success of the English at the Battle of the Spurs (1513) was succeeded by no adequate result, the taking of Tournay being the only fruit of this expensive expedition. Meantime, more splendid success attended the English arms at home, James IV of Scotland being completely defeated and slain at Flodden Field (1513). Henry, however, granted peace to the Queen of Scotland, his sister, and established an influence which rendered his kingdom long secure on that side. Finding himself deluded by his allies, he soon after made peace with France, retaining Tournay and receiving a large sum of money. From 1515 until 1529 the government was practically in the hands of Wolsey, no parliament being summoned in that period until 1523. After the election of Charles V to the German Empire, both Charles and the French king, Francis I, sought the alliance of England. A friendly meeting took place between Henry and Francis at the Field of the Cloth of Gold (1520), but the interest of Charles preponderated, and Henry declared war against France, though with no important results. Now came the determination of the king to divorce his wife Catharine, who was older than he, had borne him no male heir, and had, moreover, been in the first place the wife of his elder brother. The last of these points was the alleged ground for seeking divorce, though Henry was probably influenced largely by his attachment to Anne Boleyn, one of the queen's maids of honor. Wolsey, for his own ends, had at first been active in promoting the divorce, but drew back and procrastinated when it became apparent that Anne Boleyn would be Catharine's successor. This delay cost Wolsey his power and the papacy its authority in England. Henry in disgust eagerly caught at the advice of Thomas Cranmer, afterwards Archbishop of Canterbury, to refer the case to the universities, from which he soon got the decision that he desired. In 1533 his marriage with Catharine was declared null and an anticipatory private marriage with Anne Boleyn declared lawful; and as these decisions were not recognized by the pope, two Acts of Parliament were obtained, one in 1534 setting aside the authority of the chief pontiff in England, the other in 1535 declaring Henry the protector of the English church. But although Henry discarded the authority of the Roman Church, he adhered to its theological tenets; and while, on the one hand, he executed Bishop Fisher and Sir Thomas More for refusing the oath of supremacy, he brought many of the reformers to the stake. Finding that the monks and friars in England were the most direct advocates of the papal authority, and a constant source of disaffection, he suppressed the monasteries by act of parliament, and thereby inflicted an incurable wound upon the Catholic religion in England. The fall of Anne Boleyn was, however, unfavorable for a time to the reformers. Henry then married Jane Seymour, and the birth of Prince Edward in 1537 fulfilled his wish for a male heir. The death of the queen was followed in 1540 by Henry's marriage with Anne of Cleves, the negotiations of which were conducted by Cromwell. The king's dislike to his wife, which resulted in another divorce, became extended to the minister who had proposed the union, and Cromwell's disgrace and death soon followed. A marriage with Catharine Howard in 1541 proved no happier, and in 1542 she was executed on a charge of infidelity. In 1543 he married his sixth wife, Catharine Parr, a lady secretly inclined to the Reformation, who survived the king. In the meantime Scotland and France had renewed their alliance, and England became again involved in war. James V ravaged the borders, but was defeated at Solway Moss in 1542, and in 1544 Boulogne was captured, Henry having again allied himself with Charles V. Charles, however, soon withdrew, and Henry maintained the war alone until 1546. Disease now so much aggravated the natural violence of Henry that his oldest friends fell victims to his tyranny. The Duke of Norfolk was committed to the Tower, and his son the Earl of Surrey was executed. Henry died on January 28, 1547, and was succeeded by his son, Edward VI.

Henry, JOSEPH, physicist, was born at Albany, New York, in 1799. In 1826 he began a series of brilliant experiments in electricity, and is said to have invented the first machine moved by the agency of electro-magnetism. In 1832 he was called to fill the chair of natural philosophy at Princeton. In 1846 he was elected secretary and director of the Smithsonian Institution. His published papers, chiefly on the subjects of electricity and magnetism, include over 150 titles. He died in 1878.

Henry, MATTHEW, a celebrated English divine, was born in 1662; died in 1714.

Henry, O., pen-name of the American short-story writer, William Sydney Porter (*q. v.*).

Henry, PATRICK, orator, was born at Studley, Virginia, in 1736; died in 1799. Indolent in disposition, he tried several occupations unsuccessfully during youth, finally studying law and winning sudden distinction, in 1763, by his telling speech in a case against the clergy. His powers as an orator have never been surpassed. A remarkable speech made by him in 1765 in the House of Burgesses in Virginia led to active resistance to the Stamp Act, and its enforcement became impracticable. He was a delegate to the First Continental Congress, and in 1775 made his most famous speech before the Virginia Convention at Richmond. He was governor of Virginia 1776-79 and 1784-85, and in 1788 vigorously opposed the adoption of the Federal Constitution. He is looked upon as the most eloquent of Americans.

Henry the Lion, DUKE OF SAXONY, the most remarkable prince of Germany in the twelfth century, was born in 1129. He succeeded his father, Henry the Proud, in 1139, assuming the government of Saxony himself in 1146. At the diet of princes in Frankfort (1147) he demanded restitution of Bavaria, taken from his father by Conrad VII; but was worsted in the war which followed. It was restored to him, however, in 1154, after the death of Conrad, by the Emperor Frederick, Henry's cousin. His possessions then extended from the Baltic and the North Sea to the Adriatic, and he was successful in opposing the league formed against him at Merseburg in 1166. About two years afterwards he separated from his wife and married Matilda, daughter of Henry II of England. He then went on an expedition to the Holy Land, and during his absence his enemies, and even the emperor, made encroachments on his dominions. In 1174 he followed Frederick I on his fifth expedition to Italy, but left him at the siege of Alessandria. He was then put under the ban of the empire, and his dominions were given to other princes. Henry defended himself for a time successfully, but was at last obliged to take refuge in England. In 1182 he asked pardon of the emperor on his knees, and Frederick promised him his hereditary possessions, Brunswick and Lüneburg, on condition of his undergoing exile for three years. He therefore again went to England, but returned to Brunswick in 1184. In 1188 he was once more compelled to leave the country, and it was only in 1190, at the close of a year's fighting, that a reconciliation was finally effected. Henry died at Brunswick in 1195. He was much in advance of his age in fostering industry, science, commerce and the arts.

Henry the Navigator (*Don Henrique el Navegador*), fourth son of King John I of Portugal, born in 1394. In his youth he gave brilliant proofs of courage. When the Portuguese conquered Ceuta in 1415 Henry distinguished himself by his bravery, and was knighted by his father, after whose death he chose for his residence the city of Sagres, in Algarve, near Cape St. Vincent, and vigorously prosecuted the war against the Moors in Africa. He erected at Sagres an observatory and a school of navigation. From time to time he sent vessels on voyages to the coasts of Barbary and Guinea; resulting in the discovery of the islands of Puerto Santo and Madeira, and some years later of the Azores. In 1433 Gilianez, one of his navigators, safely doubled Cape Bojador, and other adventurers, pushing still further south, discovered Cape Blanco in 1441 and Cape Verd in 1445. A profitable commerce with the natives of West Africa was soon developed, and the Senegal and Gambia were partially explored. After acting as general against the Moors in 1458 Henry died at Sagres on the 13th of November, 1458. His efforts not only laid the foundations of the commerce and colonial possessions of Portugal, but gave a new direction to navigation and commercial enterprise.

Henryetta (hen-ri-et'a), a city of Okmulgee Co., Oklahoma, 40 miles S. W. of Muskogee, on three railroads, in a coal, zinc, natural gas and petroleum region. It has oil refineries, zinc smelters, oil mills, glass and brick works, carbon and gasoline plants, etc. Pop. (1920) 5889; with environs 30,000.

Henryson (hen'ri-sun), ROBERT, a Scottish poet born about 1425; died 1506. He wrote *Testament of Cresseid*, a continuation of Chaucer's *Troilus and Cressida*, also *Robin and Makyne*, *Æsop's Fables* in metre, etc.

Henty (hen'ti), GEORGE ALFRED, an English writer, born near Cambridge in 1832; died in 1902. He served for a time as war correspondent for London papers, and afterwards wrote a number of novels and a large number (over seventy) of books of historical fiction for boys.

Hepar Sulphuris (lit. 'liver of sulphur,' so

called from its brownish-green and liver-like appearance), a mixture of polysulphides of potassium with sulphate or thiosulphate of potash.

Hepaticæ (he-pat'i-sē), or LIVERWORTS, ranunculaceous plants belonging to the genus anemone.

Hepatitis (he-pa-tī'tēs), a disease consisting in inflammation of some part of the liver.

Hephæstion (he-fēs'ti-on), a noble Macedonian of Pella, the friend of Alexander the Great. He accompanied the king in his Asiatic campaigns, and died at Ecbatana (B.C. 325 or 324). Alexander had his body conveyed to Babylon, and erected a monument to him, costing 10,000 talents.

Hephæstus (he-fēs'tus), a god of the ancient Greeks, identified by the Romans with their Vulcanus. He presided over fire, and was the patron of all artists who worked in iron and metals. He fixed his residence in Lemnos, where he built himself a palace, and raised forges to work metals. The Cyclopes of Sicily were his workmen and attendants; and with him they fabricated not only the thunderbolts of Zeus, but also arms for the gods and the most celebrated heroes. His forges were supposed to be under Mount Ætna. Aphroditē (Venus) was the wife of Hephæstus.

Heppenheim (hep'en-hīm), an interesting old walled town of Germany in Hesse-Darmstadt, 16 miles south of Darmstadt. Pop. 6364.

Heptarchy (hep'tar-ki), the seven principal kingdoms into which England was divided in Anglo-Saxon times. The kingdoms were founded at different times, and at no one time were they all independent monarchies together. In 827 King Egbert of Wessex united the other kingdoms into one, and assumed the title of king of England. See *England*.

Heptateuch (hep'ta-tuk), a name sometimes given to the five books of Moses or Pentateuch, together with the books of Joshua and Judges.

Hera (hē'ra), an ancient Greek goddess, identified by the Romans with their Juno, the sister and wife of Zeus (Jupiter), and daughter of Kronos (Saturn) and Rhea. The poets represent Zeus as an unfaithful husband, and Hera as an obstinate and jealous wife, the result of which is frequent strife between them. She was worshipped in all Greece, but her principal seats were at Argos and at Samos. The companions of Hera were the Nymphs, Graces, and Hours. Iris was her particular servant. Among animals, the peacock, the goose, and the cuckoo were sacred to her. Her usual attribute is a royal diadem on her head. The festivals in her honor were called Heræa. The principals were those celebrated every fifth year at Argos, which city was considered to be especially under her protection.

Hera.—Antique statue

Heracles (her'a-klēs), called by the Romans *Hercules*, the most celebrated hero or semi-divine personage of Greek mythology, was the son of Zeus (Jupiter) by Alcmena, the wife of Amphitryon. He was brought up at Thebes, and before he had completed his eighth month strangled two snakes sent by the jealous Hera (Juno) to devour him. In youth he had several distinguished instructors, among them the Centaur Cheiron. Early in life he had, at the command of Zeus, to subject himself for twelve years to the will of Eurystheus, on the understanding that after he had acquitted himself of this duty he should be reckoned in the number of the gods. He therefore went to Mycenæ, and performed at the bidding of Eurystheus the tasks known as the *twelve labors of Heracles*. These were: (1) to kill a lion which ravaged the country near Mycenæ; (2) to destroy the Lernæan hydra; (3) to capture, alive and unhurt, a stag famous for its incredible swiftness, its golden horns, and brazen feet; (4) to capture alive a wild boar which ravaged the neighborhood of Erymanthus; (5) to clean the stables of Augeas, where 3000 oxen had been confined for many years; (6) to kill the birds which ravaged the country near the lake Stymphalus, in Arcadia, and ate human flesh; (7) to bring alive into Peloponnesus a prodigious wild bull, which laid waste the Island of Crete; (8) to obtain the mares of Diomedes, which fed upon human flesh; (9) to obtain from the queen of the Amazons a girdle which she had received from Ares (Mars); (10) to kill the monster Geryon, king of Gades, and bring to Argos his numerous flocks, which fed upon human flesh; (11) to obtain apples from the garden of the Hesperides; (12) the last and

most dangerous of all, to bring from the infernal regions the three-headed dog Cerberus. Besides these labors, he also achieved of his own accord others equally celebrated. Thus, he assisted the gods in their wars against the giants, and it was through him alone that Zeus obtained the victory. Having attempted to plunder the temple at Delphi, he became engaged in conflict with Apollo, and was punished by being sold to Omphälē, queen of Lydia, as a slave, who restored him to liberty and married him. Having later returned to Greece, he became the husband of De-

Heroules slaying the Hydra.—From sculpture at Florence.

janira, who unwittingly brought about his death by giving him a tunic poisoned with the blood of the Centaur Nessus, which she innocently believed would retain for her Heracles' love. The poison took effect whenever the garment was put on, and as the distemper was incurable, Heracles placed himself on a burning pile on the top of Mount Œta, was received up into heaven, and being there reconciled to Hera, received her daughter Hebe in marriage. In ancient works of art Heracles is generally represented naked, with strong and well-proportioned limbs; he is sometimes covered with the skin of the Nemæan lion, and holds a knotted club in his hand, on which he often leans. The principal ancient statue of him which remains is the *Farnese Hercules* at Rome, a work of the Athenian Glycon. The myth of Heracles is believed by many writers to represent the course of the sun through the twelve signs of the zodiac. His marriage with Hebe was explained even by the ancients as symbolic of the renewing of the sun's course after its completion.

Heracleum (her-a-klē'um), a genus of large umbelliferous herbs, the cow-parsnips, of which *H. Sphondylium* (common cow-parsnip or hog-weed) is very common in Britain in damp meadow ground and pastures. *H. giganteum* (the Siberian cow-parsnip) is often grown in shrubberies, reaching the height of 10 feet.

Heraclidæ (her-a-klī'dē), the descendants of Heracles, but more particularly those who, assisted by the Dorians, successfully asserted by arms their claim to the Peloponnesus, whence their ancestors had been driven by usurpers. See *Greece* (*History*).

Heraclitus (her-a-klī'tus), a Greek philosopher, born at Ephesus, who flourished about 513 B. C. He traveled in different countries, particularly in Africa. On his return to Ephesus he was offered the chief magistracy, but refused it. He is said to have latterly repaired to solitary mountains to live on roots and herbs; but, being attacked by a fatal disease, was obliged to return to the city, where he died soon afterwards, it is said in his sixtieth year. He left a work on Nature, in which he treats also of religion and politics. Some fragments only of this work remain. He is considered as belonging generally to the Ionic school of philosophers, though he differed from it in important particulars. He considered fire as the first principle of all things, describing it as an ethereal substance, 'self-kindled and self-extinguished,' from which the world is evolved (not made) by a natural operation. It is also a rational principle, and the source of the human soul. Phenomena exist in a constant state of flux, always tending to assume new forms, and finally returning again to their source.

Heraclius (her-a-klī'us), Roman emperor of the East, born in Cappadocia about 575 A. D.; the son of Heraclius, exarch of Africa. At the head of a fleet from Carthage, in 610 he assisted in dethroning Phocas, the murderer and successor of the Emperor Mauritius, and himself ascended the throne. In a succession of splendid victories he crushed the Persians under Chosroes; but the energy of his earlier years seems to have worn itself out, and he made no effort to check the victorious progress of Mohammed. Before his death Syria, Palestine, Mesopotamia, and Egypt had fallen under the dominion of the caliphs. He died in 641, and was succeeded by his son, Constantine III.

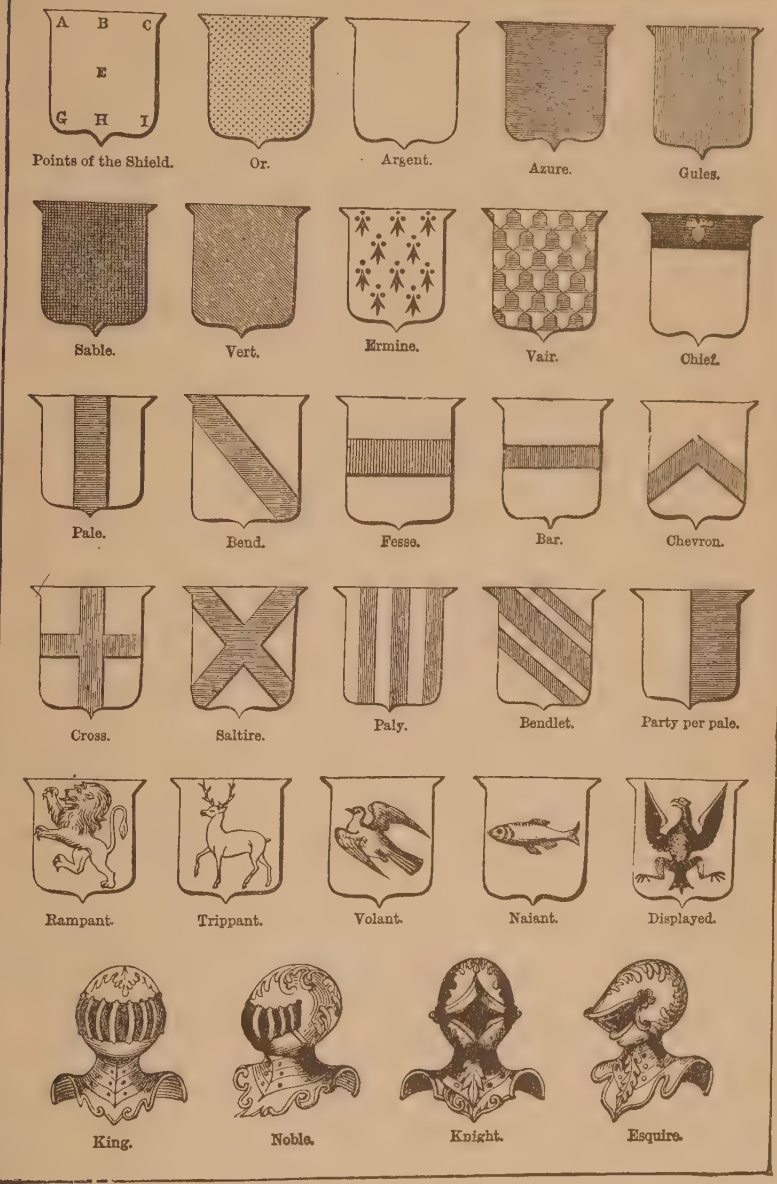
Herald (her'ald), an officer whose functions originally were to carry messages of courtesy or defiance between sovereigns or persons of knightly rank, to superintend and register the results of trial by battle, tournaments, and

other chivalric exercises, to record the valiant deeds of combatants, proclaim war or peace, marshal processions and public ceremonials, and especially, in later times, to regulate and determine all matters connected with the use of armorial bearings. Heralds began to appear about the twelfth century, and assumed the functions which ultimately belonged to their office gradually. The herald, after the office was fully constituted, was created with many ceremonies, and had to pass through various grades of protracted service before reaching the full dignity of a herald. The office is now shorn of much of its importance. Heralds are appointed in England by the earl marshal, whose office is hereditary. The Heralds' College, or College of Arms, founded by charter of Richard III in 1483, consists of the three chief heralds (see *Garter King-of-Arms*), the six subordinate or provincial heralds of York, Lancaster, Chester, Windsor, Richmond, and Somerset; two heralds appointed on the accession of George I, called Hanover herald and Gloucester king-of-arms, together with the earl marshal and secretary, in all thirteen persons. There are four marshals or pursuivants, called blue-mantle, rouge-croix, rouge-dragon, and portcullis, who usually succeed to vacancies in the Heralds' College. Among the duties of the Heralds' College are the recording of pedigrees and the granting of coats of arms to persons who wish to assume them. The Heralds' College, or Lyon Court, in Scotland, consists of Lyon king-of-arms, and six heralds, with six pursuivants.

Herald-crab, a species of crab (*Huenia heraldica*), the carapace of which presents a fanciful resemblance to the shield and mantle figured by heraldic painters in depicting coat-armor.

Heraldry (her'ald-ri), the whole science of a herald's duties, or more commonly the knowledge of the forms, terms, and laws which pertain to the use of armorial bearings or coats of arms. Badges and emblems on shields, helms, banners, etc., naturally occurred in the earliest times, and the symbols were sometimes hereditary. The origin of heraldic arms, properly so called, is, however, to be attributed to the necessity which arose during the Crusades of distinguishing the leaders of the numerous and motley bands of warriors which constituted the Christian armies. One of the oldest specimens of heraldic bearings extant is the shield at Mans of Geoffrey Plantagenet, who died in 1150. Rolls of arms in England are extant from the reigns of Henry III, Edward I, and Edward II. The use of arms on the Great Seal of England was introduced by Richard I. The bearing of coat-armor by private persons was prohibited by proclamation in the reign of Henry V. The chief courts of jurisdiction in questions of heraldry are the Heralds' College in England, and the Lyon Court in Scotland. (See *Herald.*) The rules of heraldry now practised at the Heralds' College are comparatively modern, and differ in some respects from those of other European courts. A coat of arms consists of the figure of a shield marked and colored in a vast variety of ways, so as to be distinctive of an individual, a family, or a community. The shield or *escutcheon* represents the original shield used in war, and on which arms were anciently borne. The surface of the escutcheon is termed the *field*, and the several parts or *points* of it have particular names, so that the figures which the field contains may be precisely located. Color is given in the coat of arms by means of *tinctures*, two of which are *metals*—*or* and *argent*, that is, gold and silver—the rest *colors* proper. These colors are, in heraldic terminology: *azure*, blue; *gules*, red; *sable*, black; *vert*, green; *purpure*, purple; *tenney*, orange; *sanguine*, blood-color. The last two are comparatively uncommon. An object represented in its natural colors is said to be *proper*. When not given in colors or by actual gilding the tinctures are represented by points and lines in black and white. *Or* is distinguished by small dots covering the part; *argent* is represented by leaving the space blank; *azure* is shown by horizontal lines; *gules*, by perpendicular lines; *sable*, by perpendicular and horizontal lines crossing each other; *vert*, by diagonal lines running from the dexter chief to the sinister base; *purpure*, by diagonal lines running from the *sinister* chief to the *dexter* base. Another class of tinctures are the *furs*, of which the two principal are *ermine* and *vair*, and which have also their special method of representation. The figures borne on the shield may be either purely artificial and conventional, or may represent real objects, animals, plants, etc. Of the former the most common are known as *ordinaries*, and have the following names: Chief, Pale, Bend, Fesse, Bar, Chevron, Cross, and Saltire. The *chief* is a portion of the shield at the top marked off by a horizontal line, and covers the upper third part of the field. The *pale* occupies the middle third part of the field perpendicularly. The *bend* is drawn diagonally from the dexter chief to the sinis-

Heraldry


A B C
E
G H I
Points of the Shield.
Or.
Argent.
Azure.
Gules.
Sable.
Vert.
Ermine.
Vair.
Chief.
Pale.
Bend.
Fesse.
Bar.
Chevron.
Cross.
Saltire.
Paly.
Bendlet.
Party per pale.
Rampant.
Trippant.
Volant.
Naiant.
Displayed.
King.
Noble.
Knight.
Esquire.

ter base in the form of a belt, and also occupies the third of the field. A diminutive of the bend is the *bendlet*. The *fesse* occupies the middle third of the field horizontally. The *bar* is formed after the manner of a fesse, but occupies only a fifth of the field, and is not confined to any particular part of it, except when there is only one bar, when it is put in the place of a fesse. Bars are mostly two in a field, sometimes three or more. A diminutive is the *barrulet*. The *chevron* may be regarded as made of a bend dexter and sinister issuing from the right and left base points of the escutcheon and meeting like two rafters. The *cross* is the ordinary cross of St. George. The *saltire* is the equally well-known cross of St. Andrew. The shield is often divided by lines running similarly to the ordinaries; hence when divided by a perpendicular line it is said to be *party per pale*, when by a horizontal line *party per fesse*, when by a diagonal line *party per bend*. Similarly, when it seems to bear several pales or bends or bars, it is said to be *paly*, *bendy*, or *barry* of so many pieces, 'paly of six argent and gules' for instance. *Charges* are the figures of natural and artificial things, and include animals and plants, implements and objects of all sorts, and various imaginary monsters, being drawn either on the field or on one of the ordinaries. It is a rule in heraldry that metal must not be put on metal nor color on color; hence, if the field say is *argent*, it cannot have a charge or an ordinary tinctured *or* directly upon it. Various technical terms describe the position of animals; thus, a lion is *rampant* when he is erect standing on one of his hind legs; *sejant*, when sitting; *couchant*, when lying at rest, with the head erect; *passant*, in a walking position; *gardant*, looking full-faced; *rampant gardant*, erect and looking full-faced; *salient*, in a leaping posture. So *trippant* is said of the stag when trotting; *lodged*, of the stag when at rest on the ground; *volant*, of birds in general in a flying posture; *rising*, of a bird that is preparing to fly; *displayed*, of birds seen frontwise with outspread wings; *naiant*, of fishes when swimming; and so on. The teeth and claws of lions and other ravenous beasts are called their *arms;* and when these have a special tincture the animal is said to be *armed* of such a tincture; similarly if their tongue be of a special tincture, they are said to be *langued* of this tincture. Often two or more coats of arms are united together on one shield, so that the whole may be a very complicated affair. The art of arranging arms in this way is known as *marshaling*, and when the shield is divided up into squares for the reception of different coats, it is said to be *quartered*. There are also certain exterior ornaments of the shield or escutcheon, namely, the helmet, mantling, crest, wreath, motto, and supporters. The helmet, which is placed on the top of the escutcheon, varies both in form and materials. Those of sovereign princes are of gold, those of the nobility of silver, and those of gentlemen of polished steel. The *full-faced helmet*, with six bars, is for the king and princes of the blood; the *sidelong helmet*, with five bars, is for dukes and marquises, etc.; the *full-faced helmet of steel*, with its beaver or vizor open, is for knights; and the *sidelong helmet*, with the vizor shut, for the esquire. The mantling or mantle was anciently fixed to the helmet, to which it served as a covering. Mantlings are now used like cloaks, to cover the whole achievement. The crest is placed above the helmet, with the wreath serving as a kind of support; the latter is composed of two colors wreathed or twisted together. The motto consists of the word or phrase carried in a scroll under or above the arms. Supporters were originally only ancient devices or badges, which by custom came to embellish armorial ensigns. They are called *supporters* because they hold the shield, as the lion and the unicorn in the well-known royal arms of England. The present royal arms of Britain exhibit the arms of England, Scotland, and Ireland in the four quarters of the shield; that is: Quarterly, 1 and 4, England; 2, Scotland; 3, Ireland. The arms of England are: Gules, three lions passant gardant in pale or; Scotland, or, a lion rampant within a double tressure flory counter-flory gules; Ireland, azure, a harp or, stringed argent.

Heralds' College. See *Herald*.

Herat (her-ät'), a city in the northwest of Afghanistan, in a beautiful and fertile plain, about 370 miles west of Cabul. It is inclosed by a broad deep moat, and an earthen mound surmounted by a lofty wall of unburned brick, and defended by a strong citadel. From each of four of the five gates a long street of bazaars (one vaulted throughout its entire length) leads towards a square in the center of the town. The remaining streets are narrow and dirty. The most important manufactures are carpets, sword-blades, shoes, cloaks, and sheepskin caps. The trade, almost entirely in the hands of Hindus, is greatly favored by the situation of the town on the great thorough-

fare from India westward. Herat was long the capital of the empire founded by Tamerlane. Pop. about 45,000.

Hérault (ā-rō), a department of France, on the Mediterranean coast; area, 2393 square miles. In the northwest it is covered by the Cevennes, but it descends rapidly towards the coast, which is lined by lagoons. The chief rivers, the Hérault, Orb, and Lez, are partly navigable; but the most important water communication is the Canal du Midi. The arable land, about one-sixth of the whole, is generally fertile. The vine and mulberrry are extensively, the olive more partially cultivated; fruit is abundant; and aromatic, medicinal, and dye plants are largely grown. Salt is obtained in large quantities. Capital, Montpellier. Pop. 488,285.

Herbaceous Plants (her-bā'shus), perennial plants of which the stem perishes annually, while the roots remain permanent and send forth a new stem in the following season.

Herbarium (her-bā'ri-um), or HORTUS SICCUS, a collection of dried plants systematically arranged. The specimens should be collected in dry weather, and carried home in a japanned tin-box or vasculum, a small pocket-box being desirable, however, for mosses and small plants. Very delicate specimens should be at once placed in a small field-book of unsized blotting-paper carried tightly strapped between suitable boards. At home they are carefully arranged upon bibulous paper, and pressed between smoothly planed deal boards either by putting weights upon the boards or by using a screw-press.

Herbart (her'bärt), JOHANN FRIEDRICH, a German philosopher born at Oldenburg, 1776; died, 1841. In 1805 he was extraordinary professor of philosophy at Göttingen; in 1809 he went to Königsberg as Kant's successor; but in 1883 returned to Göttingen, where he remained till his death. Herbart starts from the Kantian position by analyzing experience. He posits a multiplicity of "reals," or things which possess in themselves absolute existence apart from appreciation by the mind of man. Ethics he ranks as that branch of esthetics which investigates the agreement or disagreement between volition and the fundamental moral ideas. His works on the science of education have been much studied.

Herb-bennet (that is, Saint Bennet or Benedict's herb), a plant, *Geum urbānum*, known also as *Avens*. It is aromatic, tonic, and astringent, and has been used in medicine, and as an ingredient in some ales.

Herb-Christopher, the bane-berry, *Actæa spicata*.

Herbert (her'bert), EDWARD, LORD HERBERT OF CHERBURY, in Shropshire, an English writer, born in 1581, and educated at University College, Oxford. In 1609 he distinguished himself at the siege of Juliers under the Prince of Orange, and in 1614 served again in the Low Countries under the same leader. In 1618 he was sent ambassador to the court of France, but was recalled in consequence of a quarrel with Constable Luynes, the favorite of Louis XIII. On the death of Luynes, however, he was sent back to France as resident ambassador. At Paris, in 1624, he printed his famous book, *De Veritate*, with the object of asserting the sufficiency, universality, and perfection of natural religion. In 1625 he returned from France and was created an Irish peer, and in 1631 an English baron. He joined the parliamentary party, but subsequently quitted it, and suffered in fortune in consequence. He died in London in 1648. The character of Lord Herbert, as shown in his memoirs, was vain, punctilious, and quixotic, but open, generous, and brave. Another work of his was *De Religione Gentilium*. Soon after his death was published his *Life and Reign of Henry VIII*, and a collection of his poems was published in 1665.

Herbert, GEORGE, poet and divine, brother of Lord Herbert of Cherbury, born in 1593; was educated at Westminster and at Trinity College, Cambridge, of which he became a fellow in 1615. From 1619 till 1627 he was university orator. The death of James I in 1625 put an end to his prospects of civil promotion, and in the same year he took orders, and became a prebendary in the diocese of Lincoln. In 1630 he took priest's orders, and was presented to the rectory of Bemerton, near Salisbury, in Wiltshire. He died in 1633. His collection of religious poems, *The Temple*, was published in 1631, and the *Jacula Prudentum*, a collection of proverbs, in 1640. His poems bear the marks of an exceptionally fine nature, if not of genius, but they are marred by conceits and mannerisms. His chief prose work was *The Country Parson* (1652).

Herbert, SIDNEY, LORD HERBERT OF LEA, an English statesman son of the eleventh Earl of Pembroke, was born in 1810. He was educated at Harrow and Oxford, and was Conservative member for South Wilts from 1832 till shortly before his death. He was secre-

tary to the admiralty under Peel in 1841, and in 1845 was made secretary for war, but became a convert to free-trade, and quitted office with Peel in 1846. From 1852 to 1855 he was war secretary in the Aberdeen cabinet, and in 1859 became again secretary of war. Early in 1861 he was transferred to the House of Lords, but died in the same year.

Herbert, Victor, an American musical conductor and composer, born in Dublin, Ireland, in 1859; received his musical education in Germany, devoting special study to the violoncello. He has held the appointment of soloist and conductor in several American orchestras; and since 1904 has conducted his own orchestra in New York. His compositions include orchestral compositions, songs, etc.; and a large number of light operas, including *Babes in Toyland,* and *The Spring Maid.*

Herculaneum (hėr-kū-lā'nē-um), an ancient city about 5 miles S. E. from Naples, completely buried with Pompeii, Stabiæ, etc., by lava and ashes during an eruption of Vesuvius in the reign of Titus, A. D. 79. The site had been long sought in vain, when in 1713 three statues were found in digging a well at the village of Portici. In 1738 the well was dug deeper, and traces of buildings were found. The theater was then discovered, but though the excavations were continued for many years it is now the only building to be seen underground, as the successive excavations were immediately filled up with rubbish from a new digging. A number of public buildings and private dwellings were laid bare, and many objects of great value discovered, such as statues, busts, beautiful mosaics, wall paintings, charred papyrus manuscripts, etc. One of the houses discovered contained a quantity of provisions, consisting of fruits, corn, oil, pease, lentils, pies, and hams. Few skeletons have been found either in Pompeii or Herculaneum, so that it is probable most of the inhabitants had time to save themselves by flight. Among the most interesting objects discovered here were the papyri, over 1750 of which are now in the Naples Museum, but hardly a third have yet been unrolled, the process presenting great difficulties from the tendency of the MSS. to crumble. The knowledge of ancient art has, however, gained more by the discoveries made here than literature. Recently a design of making a complete excavation of these ruins has been entertained, but as yet no work has been done.

Hercules (her'ku-lēs). See *Heracles.*

Hercules, one of Ptolemy's northern constellations, including 113 stars. The point to which the sun, with its accompanying system of planets, is traveling at present is situated in this constellation, which includes some remarkable star groups and nebulæ.

Hercules, Pillars of, the ancient name of the two promontories, Calpe (Gibraltar) and Abyla (Ceuta), at the entrance to the Mediterranean.

Hercules-beetle, a very large Brazilian lamellicorn beetle, *Scarabæus* or *Hynastes Hercules.* An enormous horn projects from the head, and a smaller one from the thorax, and the beetle attains a length of 5 inches.

Hercynian Forest (her-sin'i-an), the general name given by the ancients to the forest-clad mountains in Central Germany, extending from the Rhine to the Carpathians.

Herder (hėr'dėr), Johann Gottfried von, a German author, born in poor circumstances in 1744. He went in 1762 to Königsberg, procured an appointment in Frederick's College, and was permitted by Kant to hear all his lectures gratis. From 1764 to 1769 he was an assistant teacher at the cathedral school of Riga, with which office that of a preacher was connected, and it was during this period that he published his *Fragments on German Literature.* In 1769 he resigned his post in order to travel, and became traveling tutor to the Prince of Holstein-Oldenburg. But in Strasburg he was prevented from proceeding by a disease of the eyes; and here he became acquainted with Goethe, on whom he had a very decided influence. Besides his *Fragments,* his 'Critical Woods' (*Kritische Wälder*) and other productions had gained him a considerable reputation, and he was appointed in 1771 court preacher, superintendent, and consistorial counselor at Bückeburg, and in 1776 to the same offices at Weimar. In 1801 he was made president of the high consistory, a place before only given to noblemen. He was subsequently made a noble by the Elector of Bavaria. He died in 1803. As a theologian Herder contributed to a better understanding of the historical and antiquarian part of the Old Testament. His *Geist der Hebräischen Poesie* ('Spirit of Hebrew Poetry') is highly valued. He did much also for the better appreciation of the classical authors. His greatest work is his *Ideen zur Philosophie der Geschichte der Menschheit* ('Ideas on the Philosophy of the History of Man,' 1785 et seq.).

He also wrote some pleasing songs and translated the Spanish epic, *The Cid.*

Hereditaments (her-a-dit'a-ments), in law, any species of property that may descend to an heir. *Corporeal* hereditaments consist of material and tangible possessions, *incorporeal* hereditaments of rights and privileges not themselves tangible, though conferring claims on tangible possessions.

Hereditary Diseases. See *Disease.*

Heredity (hẽr-ed'i-ti), the transmission from parent to offspring of physical and intellectual characters. This has been at all times believed in, but it is only in recent times that the conviction has, in the hands of Darwin, Herbert Spencer, and Wallace, been methodized so as to embody an important zoological doctrine. The modern view of evolution in biology rests upon the belief that acquired peculiarities, or differences which may arise between parent and offspring, can be transmitted with some probability of permanence, especially if the variation presented by the young is determined by external conditions, or if it is such as to adapt the possessor more thoroughly to the conditions under which it is placed. On the other hand, while variations may be thus permanently transmitted by heredity, yet this very tendency of the young to repeat the characters of the parent is also a check on variability, or the tendency of structure and attributes to change with the environment. It may be noted that while the strong tendency to hereditary transmission works in the majority of cases so as to perpetuate those most fitted to survive, it secures the same result in other cases by a converse action. The question of the heredity of acquired characters, changes arising during the lifetime of an individual, has of late years been vigorously debated, without any definite conclusion. It is strongly maintained by many zoologists that such characters cannot be transmitted to offspring, but their arguments and evidences are not sufficient to convince the many who hold the opposite view, and the problem is still an open one.

Hereford (he're-ford), a city and parliamentary borough of England, capital of a county of the same name, on the left bank of the Wye. The principal streets are broad and straight; houses mostly of brick, and the public buildings of stone. The beautiful cathedral near the Wye was rebuilt, in the reign of William the Conqueror, on the site of an earlier edifice, and restored in 1863 under the direction of Sir G. G. Scott. Other public buildings are the college adjoining the cathedral, the shire-hall, the county-jail, free library and museum, corn exchange, market-hall, and post-office. The manufactures, which are inconsiderable, consist of gloves, leather, turnery, nails, etc. Hereford was long an important garrison town on the Welsh border, and was the last city to surrender to the parliamentarians. Pop. 22,568.—The county, which is entirely inland, and borders on Wales, has an area of 833 sq. miles, nearly the whole of which is arable, meadow, and pasture. The county belongs wholly to the basin of Severn, towards which river it has a general slope north to south, as indicated by the course of its rivers, the Wye and its affluents. The soil is in general fertile. Wheat is the principal crop, but barley, oats, beans, pease, hops, and turnips are also extensively cultivated. Orchards are numerous, and a large quantity of excellent cider is made. The Herefordshire cattle are held in high estimation for meat, though not good milkers. Horses are bred in considerable numbers. Oak timber is abundant, and forms, with oak-bark, an article of export. Pop. (1911) 114,269.

Heretic (hẽr'e-tik), one who embraces a heresy, that is, one who holds some theological doctrine which conflicts with the beliefs of the Catholic or universal church, but who, at the same time, calls himself a Christian. Many of the early Christians preserved their Jewish or Greek philosophical notions, and mingled them with the doctrines of Christianity. Even in the time of the apostles we find traces of the Gnostics, and subsequently a great variety of heretical sects or sectaries arose. Among the chief may be mentioned the Manichæans, Sabellians, Arians, Apollinarians, Nestorians, Monophysites, Pelagians, Monothelites, Paulicians, etc. Among religionists stigmatized as heretics in later times by the Roman Catholic Church, were the Waldenses, the Wicliffites, Hussites, Lutherans, and all Protestant sects and churches. Before Christianity was made the religion of the Roman state, nothing but excommunication was inflicted upon the heretic; but severe laws were passed soon after the conversion of the emperors. The code of Justinian contains many ordinances against heretics, and the canon law made it a duty to denounce them, under pain of excommunication. As early as 385 Priscillian was condemned to death as a heretic by the Spanish bishops at the Council of Trèves; but the persecutions of heretics, properly so called, began in the pontificate of Gregory VII. in

the eleventh century. Spain, Italy, and France, from the thirteenth to the sixteenth century, suffered much from these persecutions, but the states of Germany showed greater moderation. In England the burning of heretics was practiced before 1200, and long continued. Heresy is now left entirely to the cognizance of the ecclesiastical courts.

Herford (her'fort), a town of Prussia, in Westphalia, 16 miles southwest of Minden. It has manufactures of linen and cotton goods, leather, basket-work, and tobacco; oil mills, etc. Pop. (1910) 32,546.

Heriot (her'i-ot), in old English law, a tribute or fine, as the best beast or other chattel, payable to the lord of the fee on the decease of the owner, landholder, or vassal.

Heriot, GEORGE (1563-1623), a Scottish goldsmith and banker, founder of Heriot's Hospital, Edinburgh. Following his father's profession of goldsmith, he also became a banker, and appointed goldsmith to Queen Anne, consort of James VI, he amassed a fortune, the surplus of which he bequeathed to found a hospital in Edinburgh for the maintenance and education of freemen's sons. Heriot appears in Scott's novel *Fortunes of Nigel.*

Heriot, GEORGE (1766-1844), a Canadian soldier and author. He wrote *History of Canada, Travels,* etc.

Herisau (hā'rē-zou), a town of Switzerland, in the canton and 4 miles northwest of Appenzell. It has manufactures of muslins, embroideries, etc. Pop. 15,502.

Heristal. See *Herstal.*

Herkimer, a village, county seat of Herkimer Co., New York, on Mohawk River and State Barge Canal, 15 miles S. E. of Utica, on New York Central and Mohawk & Malone railroads. The chief manufactured product is desks, 75 per cent of the world's output being made here. Other products are leather fibre board, knit goods, air guns, metal nut picks, nut crackers, etc. Pop. 10,453.

Herkimer, NICHOLAS, soldier, born in New York about 1715, commanded at Fort Herkimer, New York, when attacked by Indians in 1758, and in 1777 led a militia force to relieve Fort Stanwix, then besieged by British and Indians. In an engagement at Oriskany he was mortally wounded.

Hermann (hĕr'mân), JOHANN GOTTFRIED JAKOB, a German scholar, born in 1772. He began to lecture on ancient literature at Leipzig in 1794, and with this university he was connected till his death in 1848. Hermann originated valuable reforms in the method of Greek grammatical instruction; and he is especially known for his editions of Æschylus, Euripides, Aristophanes, Bion, and Moschus, and for the controversies in which his theories involved him with other scholars.

Hermannstadt (hĕr'man-stat), a town of Transylvania, on the Cibin, 54 miles S. S. E. Klausenburg. It consists of a high and a low town, connected by steep stone stairs, and of three suburbs. The high town is double walled and well built. Its origin dates back to the 12th century, and it was once an important fortress. It is the seat of the governor of the province and of the Greek metropolitan of Transylvania. The manufactures are varied, and there is an important transit trade, chiefly to and from Constantinople Pop. (1910) 25,008.

Hermaphrodite (her-maf' rū-dīt), an animal in which the characteristics of both sexes are either really or apparently combined, especially an animal having the parts of generation both of male and female, so that reproduction can take place without the union of two individuals. Hermaphrodites are divided into true and spurious, the first exhibiting a real combination of the characteristics of the two sexes; while in the second the combination is only apparent. The animals in which the organs of the two sexes are normally combined in the same individual are confined to the invertebrate division of the animal kingdom, as for example certain groups of the inferior worms, molluscs, barnacles, etc. There are no real hermaphrodites in any of the higher species of animals.

Hermaphrodite Brig, a brig that is square-rigged forward and schooner-rigged aft.

Hermas (her'mas), one of the so-called apostolic fathers, generally supposed to be the person mentioned by that name in Rom., xvi, 14, though others maintain that he lived much later. He is known as the author of a work entitled the *Shepherd,* circulated at Rome early in the second century, and for which a place in the canon was even claimed. Only a few fragments exist of the Greek original, but the Latin translation, made at a very early period, appears to be complete. It is prized as a relic of the primitive church.

Hermeneutics (her-me-nū'tiks; from a Greek word meaning to explain or interpret), the science which fixes the principles of the interpretation of the sacred writings. Her-

meneutics bears the same relation to *exegesis* as *theory* to *practice*. See *Exegesis*.

Hermēs (her'mēs), called by the Romans *Mercurius* (see *Mercury*), in Greek mythology the son of Zeus and Maia, the daughter of Atlas. He was born in Arcadia, and soon after his birth left his cradle and invented the lyre by stringing the shell of a tortoise with three or seven strings. The lyre, however, he resigned to Apollo, with whom it was ever after identified. Hermēs also invented the Pandean pipe. The ancients represent Hermēs as the herald and messenger of the gods. He conducted the souls of the departed to the lower world. He was the ideal embodiment of grace, dignity, and persuasiveness, but also of prudence, cunning, fraud, perjury, theft, and robbery. His cunning was frequently of service both to the gods and the heroes, and even to Zeus himself. Later writers ascribe to him the invention of dice, music, geometry, letters, etc. He was worshipped in all the cities of Greece, but Arcadia was the chief place of his worship, his festivals being called *Hermæa*. In the monuments he is represented as in the flower of youth, or in the full power of early manhood. He often appears with small wings attached to his head and to his ankles. Among his symbols are the cock, the tortoise, a purse, etc., and especially his winged rod, the *caduceus*.

Hermēs.—Wall painting, Pompeii.

Hermes, Georg, a German theologian, born in 1775. He studied theology at the University of Münster; became teacher in the gymnasium of that city, and in 1807 professor of dogmatic theology in the university. When the Prussian government established the University of Bonn, Hermes was appointed to the chair of Catholic theology (1820). Here he distinguished himself by an ingenious effort to base the doctrines of the church on Kant's system of philosophy—an attempt known as Hermesianism. It aroused powerful opposition, being condemned as heretical by a papal letter of 1835, two years after the death of its originator.

Hermes Trismegis'tus, a mythical personage, the reputed author of a great variety of works, probably written by Egyptian Neo-Platonists, who ascribed the authorship of the highest attainments of the human mind to Thoth, the Egyptian Hermes; regarding him as the source of all knowledge and inventions, the *Logos* incarnate, thrice greatest (Gr. *tris megistos*). Clement of Alexandria mentions the contents of forty-two books of Hermes which were extant in his time. Of those which now remain the most important is the *Poimandrēs* or *Poimander*, a dialogue on nature, the creation, the deity, the soul, knowledge, and similar topics. Of the extant works none belongs, in all probability, to an earlier date than the fourth or perhaps the third century of our era.

Hermetic Art (her-met'ik), another name for *Alchemy* (which see).

Hermitage (her'mi-tij), one of the finest French wines, produced along the Rhône between Valance and Valière, in the *ci-devant* Dauphiny. It is of two kinds, red and white; the former is preferred.

Hermit-crab, family (Paguridæ) of a name common to well-known crustaceans. These crabs take possession of and occupy the cast-off univalve shells of various molluscs, carrying this habitation about with them, and changing it for a larger one as they increase in size.

Hermit-thrush, of which there are several varieties, known under the specific names *Turdus pallasi*, *Turdus manus*, and *Turdus unalascæ*, is found in nearly all parts of N. America. It is about 7½ in. long, with a white breast spotted with dark brown and an olive head and neck which shades into dull red towards the tail.

Hermits. See *Anchorites*.

Hermon (hêr'mon), a mountain of Syria, belonging to the Anti Lebanon, about 9400 feet high.

Hermopolis. See *Syra*.

Hermosillo (hêr-mo-sil'yō), a city in the state of Sonora, Mexico, on the river Sonora, 84 miles north from the port of Guaymas, with which it has a large traffic. It has a mint, distilleries, and flour-mills Pop. 17,618.

Hernandia (hêr-nan'di-a), a genus of large East Indian

trees, forming the nat. order Hernandiaceæ. They have alternate entire leaves and flowers arranged in axillary or terminal spikes or corymbs. *H. sonora*, or Jack-in-the-box, is so called from the noise made by the wind whistling through its persistent involucels. The fibrous roots chewed and applied to wounds caused by the Macassar poison form an effectual cure, and the juice of the leaves is a powerful depilatory. The wood is light; that of *H. Guianensis* takes fire so readily from a flint and steel that it is used in the same way as amadou.

Hernandia sonora (Jack-in-the-box).

Herne, JAMES A., actor and playwright, born at Troy, New York, in 1839; died in 1901. His plays include *Hearts of Oak*, *The Minute Men*, *Drifting Apart*, *Margaret Fleming*, and *Shore Acres*, the last-named the most popular.

Hernia (hêr'ni-a), in surgery, a tumor formed by the displacement of a soft part, which protrudes by a natural or accidental opening from the cavity in which it is contained. The brain, the heart, the lungs, and most of the abdominal viscera may become totally or partially displaced, and thus give rise to the formation of hernial tumors. But the term is ordinarily applied to abdominal hernia. Every part of the abdomen may become the seat of hernia, but it most commonly appears in the anterior and inferior region, which, being destitute in a great measure of muscular fibers, and containing the natural openings, offers less resistance to the displacement of the viscera. Most of the viscera, when displaced, push the peritoneum forward before them: this membrane thus forms an envelope of the hernia, which is called the *hernial sac*. The hernia itself is usually a loop of the small bowel, and though it has been pushed through the wall of the abdomen, forming a tumor under the skin, the fæces still pass along it. If the hernia can be returned to the abdomen, it is said to be reducible; if, from its size or other cause, it cannot be replaced, it is irreducible. A hernia is said to be strangulated when it is not only irreducible, but also subjected to a continual constriction, which interferes with the circulation through the blood-vessels of the part and the passage of the fæces. It may be rapidly fatal. Constriction may be produced by different causes, but generally occurs at the margins of the opening through which the hernia protrudes. As soon as a patient perceives that he is affected with a hernia he should have recourse to medical advice, for the disease is then in its most favorable state for treatment. The hernia when it is reduced must be prevented from recurring by the constant pressure of a pad or truss. An irreducible hernia must be supported with great care. All violent exercises, and excess in diet, must be avoided. The strangulated hernia requires prompt relief, and may necessitate an operation.

Hernösand (her'neu-sân), a seaport and cathedral town of Sweden, capital of Westernorriand, on the island of Hernö, in the Gulf of Bothnia, with a considerable shipping trade. Pop. 7890.

Hero (hē'rō), a Greek priestess of Aphrodītē at Sestos, on the coast of Thrace, for love of whom Leander, a youth of Abydos, swam every night across the Hellespont, guided by a torch from her tower. He was at length drowned in the attempt and his body washed ashore, when Hero, overcome with anguish, threw herself from the tower on the corpse of her lover, and perished. There is a Greek poem by Musæus on this subject.

Hero (OF ALEXANDRIA), one of the most distinguished Greek mathematicians and mechanists of ancient times, who flourished about B.C. 150-100. A common pneumatic toy, called Hero's fountain, is attributed to him, and he also invented the æolipile, a heliostat, etc.

Herod (her'od), called THE GREAT, King of the Jews, was a native of Ascalon, in Judea, where he was born about 74 B.C. He was the second son of Antipater the Idumean, who, being made procurator of Judea by Julius Cæsar, appointed Herod to the government of Galilee. He at first embraced the party of Brutus and Cassius, but after their death reconciled himself to Antony, by whose interest he was first named Tetrarch, and afterwards King of Judea. After the battle of Actium he successfully paid court to Augustus, who confirmed him in his kingdom. On all occasions his abilities as a politician and commander were conspicuous; but his passions were fierce and ungovernable, and his wife Mariamne, her brother, grandfather, and mother, and his own sons by her, were all put to death by him. He rebuilt the temple at Jerusalem with great magnificence, and erected a

stately theater and amphitheater in that city. He also rebuilt Samaria, which he called Sebaste, and constructed many strong fortresses throughout Judea, the principal termed Cæsarea, after the emperor. The birth of Jesus Christ is said to have taken place in the last year of the reign of Herod, viz., B.C. 4, the year also signalized by the massacre of the children of Bethlehem. Herod's policy and influence gave a great temporary splendor to the Jewish nation, but he was also the first to shake the foundation of the Jewish government, by dissolving the national council, and appointing the high priests and removing them at pleasuse, without regard to the laws of succession.

Herod Agrippa I, son of Aristobulus by Berenice, daughter of Herod the Great. For his attachment to Caligula he was imprisoned by Tiberius, but on the accession of Caligula (A.D. 37) he received the government of part of Palestine, and subsequently all the dominions of Herod the Great. To please the Jews, with whom his rule was very popular, he caused St. James to be put to death, and imprisoned St. Peter. He died in the circumstances related in Acts xii, in A.D. 44.

Herod Agrippa II, son of the preceding, and last of the Herodian line. Being too young to govern, Judea was, on his father's death, reduced to a Roman province. He subsequently received the kingdom of Chalcis, and obtained the superintendency of the temple at Jerusalem. With his sister, Berenice, he heard the defence of Paul before Festus at Caesarea. Being driven from Jerusalem by the revolt of the Jews, he joined Cestius, and later on Vespasian, and during the siege of Jerusalem was very serviceable to Titus. After its reduction (A.D. 70) he and Berenice (with whom he was suspected to have an incestuous intercourse) returned to Rome. He is supposed to have died there, A.D. 94.

Herod An'tipas, son of Herod the Great by his fifth wife, Cleopatra, was appointed tetrarch of Galilee on his death (B.C. 4). This was the Herod who put to death St. John the Baptist, at the request of his wife Herodias, John having reproached them for their incestuous union. Having visited Rome he was accused of having been concerned in the conspiracy of Sejanus, and was stripped of his dominions, and sent (A.D. 39) with his wife into exile at Lugdunum (Lyons), or, as some say, to Spain, where he died.

Herodiones (hĕr-od-i-ō'nez), the herons, a modern name for an order of birds including the herons proper, but also the bitterns, storks, spoon-bills, ibises, etc.

Herodotus (hĕr-od'o-tus), the oldest Greek historian whose works have come down to us, the 'father of history,' born at Halicarnassus, in Asia Minor, about B.C. 484. Before writing his history he traveled extensively, visiting the shores of the Hellespont and the Euxine, Scythia, Syria, Palestine, Babylon, and Ecbatana, Egypt as far as Elephantine or other parts of Northern Africa, everywhere investigating the manners, customs, and religion of the people, the history of the country, productions of the soil, etc. On returning home he found that Lygdamis had usurped the supreme authority in Halicarnassus, and put to death the noblest citizens, among others his uncle, the epic poet Panyasis, and Herodotus was forced to seek an asylum in the island of Samos. Having formed a conspiracy with several exiles he returned to Halicarnassus and drove out the usurper, but the nobles who had acted with him immediately formed an aristocracy more oppressive than the government of the banished tyrant, and Herodotus withdrew to the recently founded colony of Thurii, in Italy, where he seems to have spent most of his remaining life. Here, at an advanced age, we are told by Pliny, he wrote his immortal work, a statement strengthened by the fact that events are noticed in the body of the book which occurred so late as 409 B.C., while its abrupt ending proves almost beyond question that he was prevented by death from completing it. The history is divided into nine books, each bearing the name of a muse, and is written in the Ionic dialect. The object of the historian is to narrate the conflict between the Greeks and Persians, and he traces the enmity of the two races back to mythical times. Rapidly passing over the mythical period he comes to Crœsus, king of Lydia, of whom and of his kingdom he gives a comparatively full history. The conquest of Lydia by Cyrus induces him to relate the rise of the Persian monarchy and the subjugation of Asia Minor and Babylon. The history of Cambyses and his Egyptian expedition leads him to introduce the valuable details of the history, geography, and manners and customs of Egypt, which occupy the second book. The Scythian expedition of Darius causes the historian to treat of the Scythians and the north of Europe; and the subsequent extension of the Persian kingdom affords him the

opportunity for giving an account of Cyrene and Libya. In the meantime the revolt of the Ionians breaks out, which eventually brings on the conflict between Greece and Persia. An account of this outbreak and of the rise of Athens after the expulsion of the Peisistratidæ, is followed by what properly constitutes the principal part of the work, and the history of the Persian war now runs on in an uninterrupted stream until the taking of Sestos. There are English translations of his history by Beloe, Cary, and Rawlinson, the last being accompanied by important notes and dissertations.

Heroes (hē'rōz), a name applied by the Greeks to mythical personages who formed an intermediate link between men and gods. They were demigods, whose mortal nature only was destroyed by death, while the immortal ascended to the gods. The heroic age of Greece is considered to have terminated with the return of the Heraclidæ into the Peloponnesus (B.C. 1100.) There were six great heroic races, descended respectively from Prometheus and Deucalion, Inachus, Agenor, Danaus, Pelops or Tantalus, and Cecrops. Individual families, as, for instance, the *Æacidæ*, *Atridæ*, *Heraclidæ*, belong to one or another of these races. Great sacrifices were not offered to the heroes, as they were to the Olympian deities; but groves were consecrated to them, and libations poured out on their sepulchers.

Heroin, DIACETYLMORPHINE. An alkaloid obtained from morphine by acetylization. The process consists of heating pure morphine alkaloid with acetyl chloride, washing the product obtained with dilute sodium carbonate solution and then purifying it by crystallization from hot alcohol. It occurs as a white crystalline powder, has a bitter taste, and is odorless. It is soluble in about 1700 milliliters of water, 31 of alcohol, 1.4 of chloroform, and in 100 milliliters of ether at 25° Centigrade. Its melting point is about 172° Cent. It is used as a sedative in cough mixtures and to relieve nervous irritations and moderate pain. Its effects are less depressing than those of morphine, but its use may become habitual.

Hérold (ā-rōld), LOUIS JOSEPH FERDINAND, a French musical composer, born in 1791; died in 1833. He entered the conservatoire at Paris, afterwards studied at Rome, and became musical tutor to the daughters of Murat, king of Naples. His first successful opera was *Les Rosières*, produced in 1817. This was followed by, among other minor compositions, *Le Muletier* (1823), and *Marie* (1826). His chief works, however, are the famous *Zampa* (1821), and the *Pré aux Clercs* (1832).

Heron (hĕr'un), the common name of birds of the genus *Ardea*, constituting with the bitterns the family Ardeidæ, type of what is now commonly regarded as a separate order of birds, the Herodiones. The herons are very numerous, and almost universally spread over the globe. They are distinguished by having a long bill cleft beneath the eyes, a compressed body, long slender legs naked above the tarsal joint, three toes in front, the two outer united by a membrane, and by moderate wings. The tail is short, rounded, and composed of ten or twelve feathers. The common heron (*Ardea cinerea*) is about 3 feet in length from the point of the bill to the end of the tail, builds its nest in high trees, many being sometimes on one tree. Its food consists of fish, frogs, molluscs, mice, moles, and similar small animals. It has an insatiable voracity, and digests its food with great rapidity. It haunts fresh-water streams, marshes, ponds, and lakes, as also the sea-shore. It was formerly in high esteem for the table, and, being remarkable for its directly ascending flight, was the special quarry pursued in falconry by the larger hawks. The great heron (*A. herodias*) is an inhabitant of America, and is called also great blue heron; the great white heron or egret (*A.* or *Herodias alba*) belongs to Europe; and the green heron (*A. virescens*), the flesh of which is much esteemed, is a native of North America.

Heron. See *Hero.*

Herpes (hĕr'pēz), a skin disease which, in most of its forms, passes through a regular course of increase, maturation, decline, and termination, in from ten to fourteen days. It is characterized by vesicles which arise in distinct but irregular clusters, and commonly appear in quick succession, and near together, on an inflamed base; generally attended with heat, pain, and considerable constitutional disorder. The term includes shingles and the like. The name herpes is given from the tendency of the eruption to creep or spread from one part of the skin to another (Greek *herpein*, to creep).

Herpetology (hĕr-pe-tol'ō-jĭ; from Gr. *herpeton*, a reptile), that department of natural history which treats of reptiles. See *Reptile.*

Herrera (ĕr-rā'ra), FRANCESCO, one of the greatest painters of the Seville school, was born there about 1576; died at Madrid in 1656. He de-

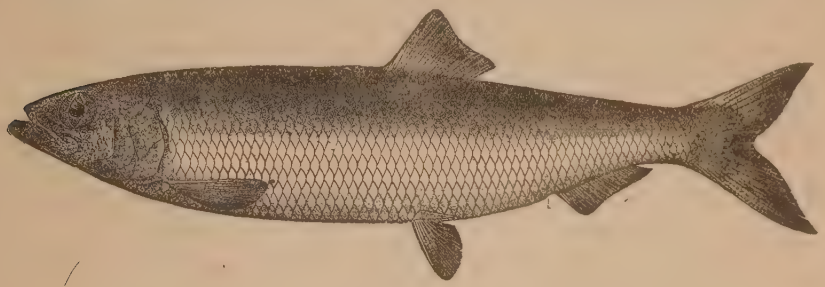
signed with spirit and vigor, and may justly be regarded as the founder of a new national school. His *Last Judgment* is a masterpiece of design and coloring. Equal praise is due to his *Holy Family* and the *Outpouring of the Holy Spirit*. He also displayed much skill in fresco painting and bronze work.—His youngest son, FRANCESCO, surnamed *El Mozo*, was born in 1622; died in 1685. He gained a great reputation in oil-painting and fresco, and became principal painter to Philip IV.

Herrick (her'ik), ROBERT, an English poet, born at London in 1591; died about 1674. He was vicar of Dean Prior in Devonshire for about 20 years; suffered deprivation under the government of Cromwell; but recovered his benefice after the restoration of Charles II, in 1660. His compositions were published in 1648, under the title of *Hesperides, or the Works, both Humane and Divine, of Robert Herrick*. It is a delightful collection of love lyrics, epigrams, sketches of rural scenery, etc.

Herrick, ROBERT, born at Cambridge, Mass., in 1868; graduated from Harvard, 1890. Since 1893 he has been associated with the University of Chicago, and has been since 1905 professor of English. His works include *The Common Lot* (1904), *The Master of the Inn* (1908), *Together* (1908), *The Healer* (1911), *One Woman's Life* (1913), *His Great Adventure* (1913), etc.

Herrin, a city of Williamson County, Illinois, 10 miles N. W. of Marion. It has a powder plant, machine shops and foundry, and there are many coal mines in its vicinity. Pop. 10,986.

Herring (her'ing), the general name of fishes of the genus *Clupĕa*, the most important of which is the *Clupĕa harengus*, or common herring. It is of wide distribution in the North Atlantic. It was formerly supposed that the herrings migrated in two great shoals every summer from the Polar Seas to the coasts of Europe and America, returning in the winter, but the migration is probably only from a deeper part of the ocean to a shallower. The feeding ground of the herring is probably the mud deposits found in the deeper parts of the sea, and it seems to be a fact that during their visits to the shallower waters of the coast for the purpose of spawning they do not feed, or feed very little. In summer the herring leaves the deep water where it has passed the winter and spring months, and seeks the coast where it may deposit its ova, and where they may be exposed to the influences of oxygen, heat, and sunlight, which are essential to their development. They are generally followed by multitudes of hakes, dog-fishes, etc., and gulls and other seabirds hover over the shoals. They swim near the surface, and are therefore easily taken by net. So great is their fecundity that the enormous number taken appears to produce no diminution of their abundance, as many as 68,000 eggs having been counted in the roe of one female. Herring, without any apparent cause, often desert parts of the coast where for a time they have been remarkably abundant, not returning in similar plenty till after the lapse of a number of years. Such seems to be the case on our Eastern coasts. The common American species, *C. elongata*, differs somewhat in its external appearance from the common European species, *C. harengus*, above described. It varies in length from 12 to 15 inches; the color above is deep blue, tinged with yellow, with silvery sides and lower parts. Herring are full of roe in the end of June, and continue in season till the beginning of winter, when they deposit their spawn. The mode of fishing for herring is by drift-nets, very similar to those employed in the pilchard fisheries: the



Pacific Herring.

fishing is carried on only in the night, the most favorable time being when it is quite dark, and the surface of the water is ruffled by a breeze. The food of the herring is believed to consist chiefly of minute crustaceans and *acaleptræ;* but it feeds also on small fishes, even the young of its own species. Other prominent members of the herring family (Clupeidæ) are the sprat or garvie (*Clupĕa sprattus*), the pilchard or gypsy herring (*C. pilchardus*), the whitebait, anchovy, etc. The alewife (*Calosa tyrannus*), a fish of the same genus as the shad, frequents the rivers of the Northern United States and Canada, and is popularly known as a herring. It is taken in large numbers, and is considered much superior to the common herring.

Mountain Herring (*Coregonus Williamsoni*). Upper, mature fish. Lower, young fish. (From Bulletin 47, U. S. Nat. Museum.)

Herrnhut (hĕrn'hŏt), a village of Saxony, 50 miles E. of Dresden. It was founded by Count Zinzendorf in 1722, for the Moravian Brethren, and it afterwards became the metropolis and center of that sect of Christians, who, from this town, are often called *Herrnhuters.* See *Moravian Brethren.*

Herschel (hĕr'shel), Caroline Lucretia, sister of the astronomer Sir William Herschel, born at Hanover in 1750; died in 1848. She joined her brother at Bath in 1771, and acted during his life as his astronomical assistant. She also found time to conduct a series of observations of her own. Her observations were published by the Royal Society, of which she was made an honorary member. On her brother's death she returned to Hanover.

Herschel, Sir John Frederick William, only son of Sir William Herschel, was born in 1792 at Slough, near Windsor; died in 1871. In 1813 he was graduated B.A. at Cambridge, and was senior wrangler and Smith's prizeman. After his father's death he spent eight years reviewing the nebulæ and clusters of stars discovered by his father. The results were given in 1833 to the Royal Society in the form of a catalogue of stars. The catalogue contained observations on 525 nebulæ and clusters of stars not noticed by his father, and on a great number of double stars, between 3000 and 4000 in all. In 1830 he produced his excellent *Preliminary Discourse on the Study of Natural Philosophy,* and about the same time published several treatises in the *Encyclopædia Metropolitana, Lardner's Cyclopædia,* etc. In 1834 he established, at his own expense, an observatory at Feldhuysen, near Cape Town, his object being to discover whether the distribution of the stars in the southern hemisphere corresponded with the results of his father's labors in the north. He returned to England in 1838, and 1847 was published *Results of Astronomical Observations made during 1834-38 at the Cape of Good Hope, being the Completion of a Telescopic Survey of the Whole Surface of the Visible Heavens.* He was one of the earliest pioneers in photography; was made a D. C. L. of Oxford; and on the queen's coronation he was created a baronet. In 1848 he was president of the Royal Astronomical Society, and in 1850 was appointed Master of the Mint, an office which he resigned in 1855. Among Sir John's other works are *Outlines of Astronomy, Familiar Lectures on Scientific Subjects,* and a translation of the *Iliad* in verse.

Herschel, Sir William, astronomer, son of a musician of Hanover, born in 1738; died in 1822. He came to England in 1757, and was employed in the formation of a military band, and in conducting, while organist at Bath, several concerts, oratorios, etc. Although enthusiastically fond of music, he had for some time devoted his leisure hours to the study of mathematics and astronomy; and being dissatisfied with the only telescopes within his reach, he set about constructing instruments for himself. Late in 1779 he began a regular survey of the heavens, star by star, with a 7-foot reflector, and discovered, March 13, 1781, a new primary planet, named by him the *Georgium Sidus,* but now known as *Urănus.* This discovery extended his fame throughout the world, and brought him a pension of £400 a year, with the title of private astronomer to the king. Assiduously continuing his observations, he measured the rotation of Saturn, discovered two of its satellites,

and observed the phenomena of its rings. He also discovered the satellites of Urănus, and observed the volcanic structure of the lunar mountains. At Slough, near Windsor, he erected a telescope of 40 feet length, and completed it in 1787. Herschel received much assistance in making and recording observations from his sister Caroline; and later his brother,

Sir William Herschel

a skillful optical instrument maker, lent him valuable aid. In 1802 he laid before the Royal Society a catalogue of 5000 nebulæ and clusters of stars which he had discovered. He was made D. C. L. by the University of Oxford, and in 1816 was knighted.

Herse, HEARSE (hėrs), a framework whereon lighted candles were placed at the obsequies of distinguished persons. The funeral herse of the middle ages was a temporary canopy covered with wax-lights, and set up in the church; the coffin was placed under the herse during the funeral ceremonies. Sometimes it was a very elaborate structure. The name has been transferred to the modern carriage for bearing a dead body to the grave.

Herse.—MS. in Bodleian Library.

Hersfeld (hers'felt), a town of Prussia, province of Hesse-Nassau, 10 miles N. N. E. of Fulda. Pop. (1905) 8688.

Herstal (hėrs'täl), or HERISTAL, a town of Belgium, on the Meuse, 3 miles northeast of Liége. It was the residence of Pepin le Gros, and afterwards of several French kings of the second race; and has a church founded by Charlemagne. Pop. 20,114.

Hertford (hėrt'fėrd), an English town, capital of Hertford County, on the Lea, 21 miles north of London. It consists of three principal streets, meeting in a central square. There are breweries and oil and flour mills. Of the castle, which was built by Edward the Elder about 905, but a small portion remains. Pop. 10,384.—The county of HERTFORD (contracted HERTS) is bounded by Cambridgeshire, Essex, Middlesex, Buckingham, and Bedford; area, 636 sq. miles. Agriculture is the principal industry. Pop. (1911) 311,321.

Hertogenbosch. See *Bois-le-Duc.*

Hertz (hertz), HENRIK, a Danish dramatic poet, was born at Copenhagen, of Jewish parents, in 1798; died in 1870. He wrote a great number of poems and novels, but his best works are his plays. Among the best known are *Svend Dyring's Huus*, a tragedy founded on an old saga, and *Kong René's Datter*.

Hertz, HEINRICH RUDOLF, German physicist, was born at Hamburg, Germany, in 1857; died in 1894. He studied at Berlin and in 1880 became assistant to Helmholtz. In 1885 he was called to the technical school at Karlsruhe, and in 1898 succeeded Clausius at Bonn. He greatly advanced the science of electricity, was the continuator of the work of Faraday and Clerk-Maxwell, and was a singularly ingenious experimenter. He demonstrated the existence of electromagnetic waves of comparatively slow frequency. The 'Hertzian' waves are propagated through space, and can be reflected, refracted, and polarized like light. Wireless telegraphy is the practical development of his discoveries. Hertz's discoveries rank with Faraday's discovery of the induction of currents, and he wrote valuable treatises on difficult problems in electricity and dynamics.

Heruli (hėr'ū-lē), an ancient Germanic people, originally found on the northern shores of the Black Sea. Under the leadership of Odoacer they helped in the overthrow of the Western Empire. About the end of the sixth century they ceased to have a separate existence as a people.

Hervey (her'vē), JAMES, an English divine, born in 1714; died 1758; was curate to his father and succeeded to the livings of Weston Favel and Collingtree. His works, which had a great popularity notwithstanding their turgid and meretricious style, include *Meditations among the Tombs; Reflections in a Flower Garden; Theron and Aspasia*, religious dialogues; and a volume of *Letters*.

Hervey Islands, a group of islands in the Pacific Ocean, S. W. of the Society Islands, lat. 20° S., lon. 160° W., consisting of nine islands, either volcanic or coraline, the largest being Raratonga. Pop. about 7000. Called also *Cook's Islands*.

Hervieu (ĕr-vyĕ'), PAUL ERNEST, a French author and dramatist, born at Neuilly-sur-Seine, France, in 1857. He has written a number of novels and plays, and in 1900 was elected to the French Academy. His plays include *Les Tenailles, La loi de l'homme, L'énigme, Le Dédale, Le Reveil, Connais-toi, Bagatelle, Le Destin est Maître*.

Herzegovina (hert-se-go-vē'nà), a province of the Balkan peninsula, now included in Jugo-Slavia, bounded on the N. by Croatia and Bosnia, on the E. by Novibazar, on the S. E. by Montenegro, and on the S. and W. by Dalmatia; area, 700 square miles. The surface is generally mountainous, but contains many fertile valleys. In accordance with the Treaty of Berlin (1878) the province was occupied by Austrian troops, and, in common with Bosnia, was governed by an Austrian military governor until 1908, when the two provinces were annexed to the Austrian empire. In 1918, following the Great war, the provinces were incorporated in the Serb-Croat-Slovene state (Jugo-Slavia). Combined pop of Bosnia and Herzegovina, 1,898,000.

Herzen (hert'sen), ALEXANDER, a Russian writer, born in 1812 at Moscow; died at Paris in 1870. While a student at Moscow he imbibed extreme philosophical and socialistic views, which brought about his imprisonment and exile. He was afterwards pardoned, but spent the latter part of his life (from 1847) abroad. Among his numerous works are the novels, *Who is to Blame?* and *Dr. Krupow; Letters from France and Italy; On the Development of Revolutionary Ideas in Russia; Recollections of my Lifetime; Memoirs of the Empress Catharine*, etc.

Herzog (hār'zoh), JOHANN JAKOB, a German Protestant theologian, born at Basel in 1805; died at Erlangen in 1882. He was successively professor of historical theology at Lausanne, church history at Halle, and latterly at Erlangen. His chief works are *Calvin and Zwingli, Life of Œcolampadius and the Reformation in Basel*, and his great *Real-Encyklopädie für Protestantische Theologie und Kirche*, a vast collection of German learning and speculation, of which he was the editor, and to which he contributed over 500 articles.

Hesiod (hē'she-od), one of the oldest poets of Greece, belonging to the eighth century B.C. and connected with Ascra, a village of Bœotia, at the foot of Mount Helicon. Little is known of his life. Of numerous works attributed to him there remain only the *Theogony*, a collection of the oldest fables concerning the birth and achievements of the gods; the *Shield of Heracles*, a fragment of a larger work; and a didactic poem, *Works and Days*, which treats of agriculture, the choice of days, etc., with prudential precepts concerning education, domestic economy, etc.

Hesperides (hes-per'i-dēz), in Greek mythology, certain nymphs who lived in gardens, of rather uncertain locality, as guardians of the golden apples that grew there, being assisted in the charge by a dragon. Hesiod places the gardens in an island of the ocean far to the west. It was the eleventh labor of Heracles to kill the dragon and bring the golden apples of the Hesperides to Eurystheus.

Hesperornis (hes-per-or'nis), a fossil bird found in the chalk formation of Kansas, about 6 feet long, without wings, and having its jaws armed with teeth, which are not set in sockets, but in a common groove. It has been described as 'a kind of swimming, loon-like, raptorial ostrich, without fore-limbs, with the gape armed with formidable rows of strong teeth like a gigantic lizard, and with a large, broad, and flattened tail like a beaver.'

Hesperus (hes'per-us), among the ancient Greeks, a name of the evening star (the planet Venus).

Hesse (hes), or HESSEN, anciently a territory of Germany, situated mainly between the rivers Neckar, Rhine, Main, Lahn, and Fulda. After various fortunes it was ruled by the landgraf Philip I, who succeeded in 1509, and at his death in 1567 divided his dominions among his four sons. The death of two of these, however, reunited the territories in part, so that there remained only the two main divisions of Hesse-Cassel and Hesse-Darmstadt, the latter now known simply as Hesse. See following articles.

Hesse, or HESSEN, FREE STATE OF, formerly known as *Hessen-*

Darmstadt, an independent state of South Germany, consisting of sundry distinct portions. Of the two main portions, one (forming the provinces of Rheinhessen on the left, and Starkenburg on the right bank of the Rhine) lies immediately to the north of Baden, the other, Oberhessen (Upper Hesse), is entirely enclosed by the Prussian province of Hessen-Nassau; area of whole grand-duchy, 2964 sq. miles. Oberhessen is generally mountainous; the provinces Starkenburg and Rheinhessen are also mountainous towards their frontiers, more especially in the southeast, but there are also extensive plains belonging to the valleys of the Main and the Rhine. The climate is greatly diversified, being cold and bleak in the mountainous districts, and mild and pleasant in the valleys of the Rhine and the Main. Much of the soil, particularly in the provinces of Starkenburg and Rheinhessen, is remarkably fertile. The vine forms a most important object of culture, and fruit is very abundant. The principal towns are Darmstadt, the capital, Mainz, Giessen, Bingen, and Worms. About two-thirds of the inhabitants are Protestants. Pop. 1,119,893.—The Grand-duchy of Hesse originated in the division of the Landgraviate of Hesse in 1567. (See *Hesse.*) In 1806 the landgraviate was erected into a grand-duchy with an enlarged territory by Napoleon. It was reduced to its present limits in 1866, when it had to cede to Prussia some districts in the north, besides Hesse-Homburg, which, after being separated from it since 1596, had been reunited to it in the beginning of the year in which it was ceded. The last grand-duke, Ludwig (Louis), married Princess Alice of Great Britain. It was proclaimed a republic in November, 1918.

Hesse-Cassel, or KURHESSEN ('Electoral Hessen'), a district of Germany, formerly an independent electorate, containing 4430 sq. miles, but now, with the exception of several small strips of territory, forming part of the Prussian province of Hessen-Nassau. It was founded in 1567. (See *Hesse.*) The last twenty years of its independent history is simply a narrative of conflicts between the people for political freedom and the elector for absolute rule. At last, on the outbreak of the German war of 1866, the elector declared himself on the side of Austria, and his territory was occupied by Prussian troops. On the conclusion of the war Hesse-Cassel was annexed to the Prussian territories as a conquered country.

Hesse-Darmstadt. *See Hesse, Grand-duchy of.*

Hesse-Homburg, before its absorption by Prussia after the German war of 1866, a landgraviate of Germany, consisting of two parts: the lordship of Homburg, situated N. N. W. of Frankfort, and the lordship of Meissenheim. It had an area of about 105 square miles, and a population of 27,000 inhabitants. The greater part of the public revenue was obtained from the gaming-tables of the watering-place, Homburg, the capital.

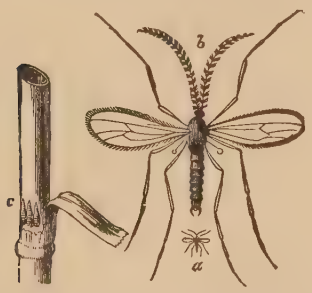
Hesse-Nassau, or HESSEN-NASSAU, a province of Prussia, formed out of the former Principality of Hesse-Cassel, the Duchy of Nassau, the Landgraviate of Hesse-Homburg, the territory and town of Frankfort, etc. It borders on the Prussian provinces of Westphalia, Hanover, Saxony, and the Rhineland, the Kingdom of Bavaria, etc., and encloses Upper Hesse. (See *Hesse, Grand-duchy of.*) The boundary is partly formed by the Rhine, Main, Weser, and Werra. Other rivers are the Lahn and Fulda. The greater part of this province belongs to the central German plateau, and has a rugged surface, partly covered by branches of the Harz. Still, about 40 per cent. of the whole is arable, while about the same is wooded. The chief mineral is iron. Mineral springs are numerous. The manufactures consist chiefly of woolens, cottons, and linen. The principal towns are Cassel, the capital, Wiesbaden, and Frankfort. Area, 6055 square miles. Pop. (1905) 2,070,052.

Hessian (hesh'an), a stout coarse cloth made of hemp.

Hessian Boots, a kind of high boots with tassel in front, worn over tight trousers, in fashion with military gentlemen in the eighteenth century.

Hessian Fly (*Cecidomyia destructor*), a fly of the family Tipulidæ, of the order Diptera (two-winged flies), the larva of which is very destructive to wheat, barley, and rye crops (it does not attack oats). It is so named from the unfounded belief, prevalent in America, where it is specially destructive, that it was brought over to that country in the baggage of the Hessian mercenaries employed against the Americans in the war for independence. The female fly is about the eighth of an inch in length, with a wing expanse of about a quarter of an inch. Its body is brown, with the upper parts, the thorax, and the head of a darker shade, approaching to black. The wings are of a dusky gray, and are surrounded with fringes. The male is somewhat smaller than the female and has longer antennæ. The

female flies usually lay their eggs on the young plants twice in the year, in May and September, out of which eggs the maggots hatch in from four to fourteen days. These work themselves in between the leaf-sheath and the stem, and fix themselves near the lowest joints, often near the root, and suck the juices



Hessian Fly (*Cecidomyia destructor*).
a, Male (natural size). *b*, Male (magnified).
c, Pupæ fixed on the joint of the wheat-stalk.

of the stem, so that the ear falls down at a sharp angle. These maggots turn to pupæ, from which the flies develop in about ten days. It has long been a pest in America and Germany, but did not appear in Britain till the summer of 1886.

Hessians. In 1775, during the Revolutionary War in America, the British king called for volunteers to put down the rebellion. As these came but slowly, he hired mercenary troops from the German states, obtaining nearly 30,000 in all. As many of these came from Hesse-Cassel the general term of 'Hessians' was applied to them. Some of them, taken prisoners, settled in the United States after the war.

Hestia (hes'ti-a), one of the later Greek goddesses, equivalent of the Latin Vesta.

Heteral'ocha. See *Huia-bird.*

Heterocercal (h e t-e-ro-sêr'kal), a term applied to ganoid and elasmobranchiate fishes, in which the vertebral column runs to a point in the upper lobe of the tail, as in the sharks and sturgeons.

Heteropoda (het-er-op'o-da), an order of marine molluscs, the most highly organized of the Gasteropoda. In this order the foot is compressed into a vertical muscular lamina, serving for a fin, and the gills, when present, are collected into a mass on the hinder part of the back. The chief genera are *Carinaria* and *Firŏla.*

Heteroptera (h e t-er-op'tĕr-a; Gr. *hetĕros*, different, and *pteron*, a wing), a section of hemipterous insects comprising those in which the two pairs of wings are of different consistence, the anterior part being h o r n y or leathery, but generally tipped with membrane. They comprise the land and water bugs. By s o m e naturalists the Heteroptera are separated from the Homoptera (the other section of the Hemiptera), and raised into a distinct order.

Heteroptera.
a, the Scutellum; *b*, Hemelytra.

Hetman (het'man), or Ataman, the title of the head (general) of the Cossacks. This dignity was abolished among the Cossacks of the Ukraine by Catharine the Great, and although the Cossacks of the Don still retain their hetman, the former freedom of election is gone, and the title of chief hetman is now held by the Russian heir-apparent to the crown.

Heuglin (hoi'glin), Theodor, Baron von, a German traveler, born in 1824; died in 1876. He first became known by his travels in the region of the White Nile and Abyssinia (1854); took part in the German expedition of 1861-62 to the Egyptian Soudan; and afterwards accompanied Mdme. Tinné in her expedition to the Upper Nile. In 1870-71 he made a journey to the region of Spitzbergen and Nova Zembla, and in 1875 a last journey to the shores of the Red Sea. He published several volumes of African travel and natural history.

Heureaux (hū-rō'), Ulysses, President of San Domingo, born at Porto Plata, in 1846. He engaged in the war against Spain, was elected president in 1882 and twice re-elected, and after two unsuccessful efforts to assassinate him, he was killed in a third attempt, in 1899.

Hewlett (hū'let), Maurice Henry, an English novelist, born in 1861. His best known book is *The Forest Lovers*, a work of much merit, which was awarded an Academy prize in 1899. Others are *A Masque of Dead Florentines*, and *Songs and Meditations.*

Hexachord (heks'a-kōrd), in the ancient music, an interval of four tones and one semitone, equivalent to that which the moderns call a *sixth.*

Hexagon (heks'a-gon), a plane figure of six sides and six angles. When these lines are equal the figure is called *a regular hexagon.*

Hexahedron (heks'a-hē'dron), a figure having six faces, or a solid bounded by six planes. The term cube is now generally applied to the *regular hexahedron.*

Hexameter (heks-am'e-tėr), a verse of six feet, the heroic or epic measure of the Greeks and Romans. The sixth foot is always a spondee (two long syllables) or a trochee (a long and a short). The first five may be all dactyls (two short syllables and one long), or all spondees, or a mixture of both. The scheme of this verse then is—

—⏑⏑ | —⏑⏑ | —⏑⏑ | —⏑⏑ | —⏑⏑ | ——
or,-- — | — — | — — | — — | — — | —⏑

with all the varieties which the mingling of the two kinds of feet affords. In modern poetry the hexameter has been frequently used. In English hexameters accent is almost entirely substituted for length, and trochees generally take the place of spondees. Longfellow in his *Evangeline*, Kingsley in his *Andromeda*, and Clough in his *Bothie*, have adopted this form of verse. The following lines are specimens of Clough's English hexameters :—

O let us | try, he | answered, the | waters them | selves will sup | port us, |
Yea very | ripples and | waves will | form to a | boat under | neath us.

Hexandria (heks-an'dri-a), in the Linnæan system of botany, a class of plants having six stamens, which are all of equal or nearly equal length.

Hexapla (heks'a-pla; Greek, *hexapla*, 'six-fold'), a collection of the Holy Scriptures in six languages; applied particularly to the combination of six versions published by Origen, containing the Hebrew text with a transcript of it in Greek characters, the Septuagint, and three other versions, those, namely, of Aquila, Symmachus, and Theodotion. It is only extant in fragments.

Hexastyle (heks'a-stīl), in architecture, a term applied to a portico or temple which has six columns in front.

Hexham (heks'am), a town of England, in Northumberlandshire, on the Tyne, about 20 miles west from Newcastle. There are here ruins of an abbey church, originally a cruciform structure, built about 674, destroyed two centuries later by the Danes, renovated in 1113, and demolished by the Scots in 1296. Hats, gloves, and leather are manufactured, but the industries are chiefly agricultural. Pop. 8417. The Battle of Hexam, fought 15th May, 1464, was one of those belonging to the wars of the Roses. The Lancastrians under Somerset were defeated by Montagu.

Heydeck (hī'dek), Karl Wilhelm von, sometimes called *Heidegger*), a Bavarian landscape painter, born at Saaralben, in Lorraine, in 1788; died at Munich in 1861. He entered the military academy at Munich in 1801, and rose to the rank of lieutenant-general.

Heylin (hā'lin), Peter, an English theologian, born in 1600; died in 1662. He published his *Microcosmos, or Description of the Globe*, in 1625. In 1629 he became chaplain to Charles I, and obtained several benefices, from which he was ejected during the civil war. At the Restoration he was made subdean of Westminster. He wrote a *Life of Laud*, *A Defense of the Church of England*, and several theological works.

Heyne (hī'nė), Christian Gottlob, an eminent German scholar and critic, born 1729; died 1812. He was educated at Chemnitz and at Leipzig University, and after a long struggle with poverty he received, in 1763, an invitation to become professor of eloquence and poetry at Göttingen. He was soon after (1764) appointed first librarian, and remained here till his death. He particularly applied himself to classical criticism and the illustration of the writings of the ancients, and published valuable editions of Homer, Pindar, Diodorus Siculus, Epictetus, Virgil, Tibullus, etc.

Heyse (hī'zė), Paul Johann Ludwig, a German novelist and dramatist, born at Berlin in 1830; settled at Munich in 1854. He wrote many plays, and short stories; but his fame rests on his great novels, including *Die Kinder der Welt* ('The Children of the World'), and *Im Paradiese* ('The Paradise Club'), generally recognized as among the most powerful and artistic works of modern German fiction. He died April 2, 1914.

Heyward (hā'ward), Thomas, signer of the Declaration of Independence, born in St. Luke's parish, S. C., in 1746; died there 1809; member of the first General Assembly of South Carolina after the flight of the royal governor; of the committee of safety; a delegate to Congress 1775–1778; was in active military service in South Carolina, where he was wounded in 1780.

Heywood (hā'wụd), a municipal borough of England, in Lancashire, about 8 miles northwest of Man-

chester. The making of power-looms, iron and brass founding, boiler-making, and all branches of cotton spinning and manufacturing, are extensively carried on. Pop. (1911) 26,698.

Heywood, JOHN, an early English dramatist, lived in the first half of the sixteenth century, and died at Mechlin about 1565. Sir Thomas More introduced him at the court of Henry VIII, with whom he became a favorite. His zealous attachment to the Roman Church recommended him to Queen Mary; but this very circumstance rendered him an object of suspicion during the two succeeding reigns, and he found it expedient to retire to the Continent. Heywood's dramatic works may be classed as *Interludes*, as they stand between the miracle-plays and the drama proper. Among them are: *A Mery Play between the Pardoner and the Frere, the Curate and Neybour Pratte; A Parable of the Spider and the Fly; the Four P's;* etc.

Heywood, THOMAS, dramatist, lived in the reigns of Elizabeth, James I, and Charles I. He was born in Lincolnshire, and educated at Cambridge. He composed wholly or in part 220 different plays. Of these only about twenty-four remain, of which the one most admired is *A Woman Killed with Kindness*, published in Dodsley's *Collection*. He was also the author of *Great Britain's Troy, An Apology for Actors*, and a number of other works.

Hezekiah (hez-e-kī'a; *Hizkiyah*, generally *Hizkiyahu*, strength of Jehovah), the twelfth King of Judah, and one of the best. He succeeded Ahaz about 717 B.C., and died about 698 B.C. He repressed idolatry, fought successfully against the Philistines, and hoped to become entirely independent of Assyria, but had his fenced cities captured, and was mulcted in a large tribute. About this time Hezekiah had a serious illness from which he miraculously recovered, and celebrated his fresh lease of life in a thanksgiving preserved in Isaiah, xxxviii. Among the ambassadors who came with letters and gifts to congratulate him on his recovery was the viceroy of Babylon, to whom he displayed the royal treasures. For this he received a terrible rebuke, and he was told by Isaiah that from Babylon would come the ruin and captivity of Judah. The greater part of the Scripture records bearing on the reign of Hezekiah is occupied by the two invasions of Sennacherib, and the sudden destruction of the Assyrian army. Hezekiah did not long survive this deliverance.

Hiawatha (hī-a-wâ'thâ), an Indian legendary hero and peace-maker, known by this name among the Iroquois and by other titles among the other tribes of North America. He is mentioned in various works on the aborigines, and in 1855 was immortalized in the poem, *Hiawatha*, by Longfellow.

Hibben, JOHN GRIER, an American educator, born in Peoria, Illinois, in 1861. He was graduated at Princeton University, in 1882, and at Princeton Theological Seminary, 1886. After a year of study at the University of Berlin he was ordained a Presbyterian minister in Chambersburg, Pennsylvania. In 1891 he became instructor at Princeton; in 1893, professor of logic; and in 1912, president of the university.

Hibbing, a village of St. Louis Co., Minn., 84 miles N.W. of Duluth. Iron mining is the principal industry. Pop. (1910) 8832; (1920) 15,089.

Hibernia (hī-ber'ni-a), the ancient name of Ireland, applied to it first by Julius Cæsar.

Hibernians, ANCIENT ORDER OF, a Catholic organization instituted about 1650 for the protection of the Catholic religion in Ireland, but now devoted to 'the advancement of the principles of Irish nationality.' It has extended to other countries. The American branch has 250,000 members.

Hibiscus (hī-bis'kus), an extensive genus of plants, nat. order Malvaceæ (mallows), chiefly natives of tropical climates. The species are remarkable for abounding in mucilage and for the tenacity of the fiber of their bark, whence several are employed for many economical purposes in the different countries where they are indigenous. The petals of *H. rosa-sinensis*, a plant with large, handsome, usually red flowers, frequent in green-houses, are astringent, and used in China as a black dye for the hair and eyes. The handsome flowering shrub known in gardens as *Althæa frutex* is a species of hibiscus (*H. syriacus*). The root of *H. Manihot* yields a mucilage used in Japan as size and to give a proper consistence to paper. The leaves of *H. cannabinus* are eatable, and an oil is extracted from its seeds, while it is cultivated in India for its fiber.

Hiccup, or HICCOUGH, (hik'up), is a convulsive catch of the respiratory muscles, with sonorous inspiration repeated at short intervals. Though generally a trivial and transient inconvenience, its occurrence in the last stages of acute disease is often a fatal symptom.

Hickes (hiks), GEORGE, an English divine, philologist, and antiquary, was born in 1642; died in 1715. He became dean of Worcester in 1683,

but of this he was deprived in 1690 for refusing to take the oaths to William III after the Revolution. He followed the fortunes of James II, and was consecrated suffragan bishop of Thetford in 1694. He wrote an Anglo-Saxon grammar, etc.

Hickory (hik'o-ri), a city of Catawba Co., North Carolina, 67 miles N. W. of Charlotte. Seat of Lenoir College and Claremont Female College. Has manufactures of furniture, pumps, carriages, hosiery, foundry products, etc. Pop. 5076.

Hickory (hik'o-ri), the name given to several species of timber trees of the genus *Carya*, belonging to the nat. order Juglandaceæ (walnut). They are natives of the United States, and are remarkable for stateliness and general beauty. The wood is heavy, strong, and tenacious, and is used for making carriage-shafts, screws, whip-handles, cogged wheels, etc. The shagbark (*C. alba*) yields the hickory nut of commerce, and its wood is very valuable. *C. olivæformis* yields the pecan-nut. The pig-nut or brown hickory is the *C. glabra*, and the swamp hickory is *C. amara*, so called from the bitterness of its nut.

Hicks, ELIAS, a noted preacher in the Society of Friends, born at Hempstead, New York, in 1748; died in 1830. He was an active abolitionist, and was instrumental in inducing the New York legislature to pass an act in 1827 which liberated all slaves within the state. His ministerial services were continued for 50 years without compensation, and he gradually came to advocate the most radical Unitarian doctrines. This in time led to a disruption of the society, a body being organized under his teachings who are now popularly known as 'Hicksites.'

Hidalgo (ē-thäl'gō), a state situated in the center of Mexico. In the N. it is very mountainous and well wooded, with extensive silver, copper, and iron mines; but in the S. it is level and fertile, and stock-raising and farming are the chief industries. It has also a trade in cotton and tobacco. Area, 8575 sq. m. Pop. 641,895.

Hides (hīds), the skins of animals, either raw or dressed; but the name is more commonly given to the undressed skins of the larger domesticated animals, as oxen, horses, etc., the smaller being called skins. The hide trade is now an important one.

Hieracium (hī-er-ā'si-um). See *Hawkweed.*

Hiera Picra (hī'er-a pi'kra), 'Holy Bitter,' a warm cathartic composed of aloes and canella bark made into a powder and mixed with honey, still a favorite in domestic medicine and veterinary practice.

Hierapolis (hī-er-ap'o-lis), a ruined city of Asiatic Turkey, near the right bank of the Lycus, 121 miles east by south of Smyrna. It was famous for its thermal springs, was the birthplace of Epictetus, and is mentioned by St. Paul in his epistle to the Colossians (iv, 13).

Hierarchy (hī'ér-ar-kē; from Gr. *hieros*, sacred, and *archō*, government), sacred government, sometimes the church, sometimes the rule which the ecclesiastical governing body exercised as at once priests and civil magistrates. In the former sense the hierarchy arose with the establishment of the Christian church as an independent society. In the middle ages the papal hierarchy gathered great strength, and the pope became a spiritual monarch, ruling western Christendom with power but feebly limited by princes and councils. A reactionary movement began in the 14th century, and the general tendency of subsequent events has always been to make the civil and hierarchical power more and more independent of each other. The term *hierarchy* as used to denote the governing and ministering body in the church, according to its several gradations, can strictly be applied only to those churches which are ruled by bishops, such as the Roman Catholic Church and the Anglican Church, which also holds the theory of a hierarchical gradation of rank and authority. Both these churches comprise the three orders of bishops, priests, and deacons.

Hieratic Writing (hī-ér-at'ik; Gr. *hieratikos*, sacred), the mode of writing used by the Egyptian priests in their records. See *Hieroglyphics.*

Hiero I (hī'e-rō), an ancient Greek ruler or 'Tyrant' (that is, absolute monarch) of Syracuse in Sicily, brother of Gelon, whom he succeeded in 478 B.C. He was an enlightened ruler, and a patron of genius and learning. His court became the rendezvous of the most distinguished writers of his time, including Pindar, Æschylus, Bacchylides, Epicharmus, and Simonides. The *Hiero* of Xenophon contains the finest eulogium of this monarch. He was several times victor in the Grecian games. Pindar has celebrated his victories; several odes of this poet are filled with his praises. Hiero died at Catana, 467 B.C.

Hiero II, King or Tyrant of Syracuse (269-214 B.C.), son of Hierocles, a noble Syracusan, who claimed a descent from the family of

Gelon. He was chosen by the soldiers as general in 275 B.C., and recognized as king about 270. In 264 he made an alliance with the Carthaginians against Rome, and thus began the first Punic war. Being defeated by the Romans he made peace by the payment of tribute, and was ever after a faithful and useful ally to them. His subjects enjoyed great prosperity during his reign. Hiero devoted himself to the construction of military machines of all kinds, and ships of great size, under the direction of Archimedes, who lived in Syracuse during this reign.

Hierochloe (hī-ér-ok'lo-e), HIEROCHLOA. See *Holy-grass*.

Hieroglyphics (hī - ér - u - glif'iks; from Gr. *hieros*, sacred, and *glypho*, I engrave), a term originally applied to the inscriptions sculptured on buildings in Egypt, in the belief that the writing was confined to sacred subjects, and legible only to priests. The term has also been applied to picture-writing in general, such as that of the Mexicans and the still ruder pictures of the North American Indians. Three different modes of writing were used by the ancient Egyptians, the *Hieroglyphic*, the *Hieratic*, and the *Demotic*. Pure hieroglyphic writing is the earliest, and consists of figures of material objects from every sphere of nature and art, with certain mathematical and arbitrary symbols. Next was developed the hieratic or priestly writing, the form in which most Egyptian literature is written, and in which the symbols almost cease to be recognizable as figures of objects. Hieratic writings of the third millennium B.C. are extant. In the demotic or *enchorial* writing, derived directly from the hieratic, the symbols are still more obscured. The demotic was first used in the ninth century B.C., and was chiefly employed in social and commercial intercourse. Down to the end of the eighteenth century scholars failed to find a clue to the hieroglyphic writings. In 1799, however, M. Bouchard, a French captain of engineers, discovered at Rosetta the celebrated stone which afforded European scholars a key to the language and writing of the ancient Egyptians. It contained a tri-lingual inscription in hieroglyphics, demotic characters, and Greek, which turned out to be a decree of the priests in honor of Ptolemy V, issued in 195 B.C. The last paragraph of the Greek inscription stated that two translations, one in the sacred and the other in the popular Egyptian language, would be found adjacent to it. The discovery of an alphabet was the first task. The demotic part of the inscription was first examined by De Sacy and Akerblad, and the signification of a number of the symbols ascertained. The hieroglyphic part was next carefully examined and compared with the demotic and Greek. At last after much study Champollion and Dr. Thomas Young, independently of each other, discovered the method of reading the characters (1822), and thus provided a clue to the decipherment of the ancient Egyptian writing.

Hieroglyphic characters are either *ideographic*, *i. e.*, using well-known objects as symbols of conceptions, or *phonetic*, *i. e.*, representing words by symbols standing for their sounds. The phonetic signs are again divided into alphabetical signs and syllabic signs. Many of the ideographic characters are simple enough: thus the figure of a man, a woman, a calf, indicate simply those objects. Others, however, are less simple, and convey their meaning figuratively or symbolically. Water was expressed by three zigzag lines, one above the other, to represent waves or ripples of running water, milk by a milk-jar, oil by an oil-jar, fishing by a pelican seizing a fish, *i. e.*, fishing; seeing and sight by an eye; and so on. The nature of the phonetic hieroglyphs, which represent simply sounds, will be understood from an explanation of the accompanying cuts.

1. The first hieroglyph in the name of Kleopatra is a knee, which is *kne* or *kle* in Coptic, and represents the K of Kleopatra. K does not occur in the name Ptolemaios. 2. The second hieroglyph in Kleopatra is a lion couchant, which is *laboi* in Coptic, and *labu* in the old Egyptian, and represents the L of both names. In Kleopatra it occupies the second place, and in Ptolemaios the fourth. 3. The third hieroglyph in Kleopatra is a reed, which is *aké* in Coptic and *aak* in the old Egyptian and represents the E of Kleopatra. The reed is doubled in Ptolemaios and occupies the sixth and seventh places, where it represents the diphthong ai of Ptolemaios. 4. The fourth hieroglyph in Kleopatra is a noose, which represents the O of both names and occurs in the third place of Ptolemaios. 5. The fifth hieroglyph in Kleopatra is a mat, which represents the P of both names, and is the initial of Ptolemaios. 6. The sixth hieroglyph in Kleopatra is an eagle, which is *akhoom* in Coptic, and repre-

Cartouche of Cleopatra.

sents the A, which is found twice in the name Kleopatra, but does not occur in the name Ptolemaios, although the diphthong *ai* occurs as described above, No. 3. 7. The seventh hieroglyph in Kleopatra is a hand, which is *toot* in Coptic, and represents the Ƒ of Kleopatra, but does not occur in Ptolemaiós, where it might be expected to occupy the second place. The second place of Ptolemaios is occupied by a semicircle, which is found at the end of feminine proper names, and is the Coptic feminine article T. The researches of Champollion satisfied him of the existence of homophones, or characters having the same phonetic value and which might be interchanged in writing proper names. 8. The eighth hieroglyph in Kleopatra is a mouth, which is *ro* in Coptic, and represents the R of Kleopatra. 9. The ninth hieroglyphic in Kleopatra is the eagle, which is explained in No. 6 above. 10. The semicircle is the T of Ptolemaios, which with 11, the egg found at the end of proper names of women, is a feminine affix. In the name of Ptolemaios there is still the M and the S to account for. The fifth hieroglyph in the cartouche of Ptolemaios is a geometrical figure, consisting of three sides of (probably?) a parallelogram, but now called a hole, because the Coptic *mu* has that signification, and represents the M. The hook represents the S of the word Ptolemaios. Vowels were only regarded by the Egyptians as they were needed to avoid ambiguous writing.

Cartouche of Ptolemy.

There are groups of hieroglyphs of which one element is an ideographic sign, to which a phonetic complement is added to indicate the pronunciation of the ideographic sign. The words of a text could be written in hieroglyphs in three ways—1, by phonetic hieroglyphs; 2. by ideographic hieroglyphs; and 3, by a combination of both. According to Ebers, in the perfected system of hieroglyphics the symbols for sounds and syllables are to be regarded as the foundation of the writing, while symbols for ideas are interspersed with them, partly to render the meaning more intelligible, and partly for ornamental purposes, or with a view to keep up the mystic character of the hieroglyphics.

Hieronymites (hī-ḕr-on'i-mīts), or JERONYMITES, hermits of St. Jerome (Hieronymus), an order of religious persons established in 1374, who wear a white habit with a black scapulary. They possessed the convent of St. Lawrence in the Escurial, and still have convents in Sicily, the West Indies, and South America.

Hieronymus, ST. See *Jerome, St.*

Higginson (hig'in-sun), THOMAS WENTWORTH, an American writer, born in Cambridge, Massachusetts, in 1823. An active abolitionist, he took part in the troubles in Kansas in 1856, and was colonel of a colored regiment in the Civil war. He is the author of works of history, fiction, biography, and essays, including *Malbone,* a romance, *Outdoor Papers, Oldport Days, History of the United States, Concerning All of Us, Tales of the Enchanted Islands,* etc. He died May 9, 1911.

High Altar. See *Altar.*

High Church, a term applied to a party in the Church of England. It originally indicated a party among the younger clergy during the latter part of the reign of Elizabeth, who asserted that Calvinism was inconsistent with the ancient doctrine and constitution of the primitive church, and who claimed a divine right for episcopacy. Bishop Andrewes was the chief writer of this party, and Laud became its most active leader. The term now generally refers to those who exalt the authority and jurisdiction of the church, and attach great value to ecclesiastical dignities and ordinances, being more or less identified with the ritualistic party. See *Ritualism.*

Highland Park, a residential city of Lake Co., Illinois, picturesquely situated on Lake Michigan, 23 miles N. of Chicago. It is the home of the Northwest Military Academy. Pop. (1920) 6167.

Highland Park, a city of Wayne Co., Michigan, adjoining Detroit on the N. W. There are here great automobile plants, notably the Ford Company and other establishments. Pop. (1910) 4120; (1920) 46,499.

Highlands (hi'landz), a somewhat indefinite geographical divison of Scotland, N. and W. of a line running N. E. from Dumbarton on the Clyde through the counties of Dumbarton, Stirling, Perth, Forfar, Kincardine; then N. W. through Aberdeen, Banff, Moray, and Nairn to the shores of the Moray Firth. The Highlands are generally subdivided into two parts, the West Highlands and the North Highlands. The whole of the district, which embraces the Celtic-speaking part of Scotland, is wild,

rugged, and mountainous, with much grand and picturesque scenery. The western coast is indented by many narrow arms of the sea, and is flanked by numerous islands. Forming, by their natural characteristics, a region distinct from the Lowlands of Scotland, the Highlands were long in a state of political semi-independence, and socially and otherwise —and particularly in retaining the use of the Gaelic tongue—the people have still certain characteristics peculiar to themselves. What especially separated this region from the rest of Scotland, was not only the Celtic language and blood, but also the clan system and all connected with it. See *Clan.*

In the earliest times the Highland chiefs gave allegiance to higher chiefs or princes, by whom the Scottish kings were acknowledged as sovereigns merely in name. Among these native princes were the powerful lords of the Isles, who flourished from very ancient times to the reign of James V. They ruled over all the Western Islands (the Hebrides) from Islay north, and over the western part of the county of Inverness, and as powerful allies exerted an influence over the greater part of the Highlands. In the early part of the fifteenth century the Highlanders threatened to overrun great part of the Lowlands, but they received a check in the defeat of Donald of the Isles at Harlaw in 1411. From this time onward their incursions on the Lowland parts of Scotland were confined chiefly to occasional plundering raids. In the wars of the seventeenth century the Highlanders were largely engaged on the side of the Stuarts, and great numbers fought under both Montrose and Dundee. After the suppression of the rising of 1715 a strenuous attempt was made to break up the tribal organization of the Highlanders. An act was passed in 1724 for their disarmament; between 1726 and 1737 great military roads were formed under the direction of General Wade, and a chain of fortified military posts constructed, to overawe the people. The chieftains made every effort to maintain their threatened power, and to destroy the effect of the innovations with which the government sought to weaken the bonds of the clans, but the weakening went on. The rebellion of 1745 gave the government an opportunity of hastening the process, by the abolition of heritable jurisdictions (which see), and of the ancient privileges of the chiefs. A stringent law for disarming the people was passed, and they were even prohibited from wearing their national dress, a prohibition not formally removed till 1782. The great extension of sheep-breeding and the appropriation of large tracts to game have tended much to depopulate some parts of the Highlands. In other parts, notably in some of the Western Islands, the population has increased beyond a point where their circumscribed condition could support them, and much discontent, agitation, and trouble have been the result. (See *Crofters.*) The Highland dress, so well known at the present day, is modern in a good many of its features, and especially so in the great variety of tartans that have been invented, and of which each clan now appears to claim one. There are a number of regiments in the British army originally recruited in the Highlands, and known as Highland regiments, or Highlanders. The organization of these is still kept up, each regiment having its distinctive tartan, some retaining the kilt, others wearing trousers.

Highness (hī'nes), a title of honor given to princes or other persons of rank, used with poss. pronouns *his, her,* etc., and with the addition of *royal, imperial, serene,* applied to the members of royal, imperial, and some German sovereign families.

High Places, in Scripture, eminences or mounds on which sacrifices were offered. Altars and places of worship were erected from the very earliest times on the tops of hills, etc. As such a practice led to idolatrous observances, it was strictly forbidden by the law of Moses. High places are frequently mentioned in conjunction with *groves.*

High Point, a city of Guilford Co., North Carolina, 78 miles N. E. of Charlotte. Has many furniture and wood-working mills, cotton and tobacco factories, etc. Pop. (1920) 14,302.

High Priest, the head of the Jewish priesthood. In the books of Moses the holder of this dignity is simply designated the priest; the epithet *high* occurs on one or two occasions, but as a distinctive epithet it appears to have been added subsequently. The formal consecration of Aaron, the brother of Moses, together with his sons, to a hereditary priesthood, is recorded in Exod., xxviii. The high priesthood continued in the line of Aaron, sometimes in one, and sometimes in another branch of it, until the coming of Christ. From B.C. 153 till the time of Herod the Great the regal and priestly authority were united in members of the Asmonæan family (the Maccabees). After the subjugation of the Jews the high priesthood was often arbitrarily conferred by the foreign masters.

High Seas, the open sea. The principle now accepted regarding the ocean highway is that the jurisdiction of maritime states extends for only 3 miles, or within cannon range of their own coasts, the remainder of the seas being high seas, accessible on equal terms to all nations. Inland seas and estuaries, of course, are excepted.

High Schools, in the United States, public schools offering instruction between the elementary or common schools and the college or university. The high school has gradually superseded the older academy or elementary school of the classical type, and the curriculum is being constantly altered to meet the needs of the modern industrial system. Business subjects, manual training, agriculture, and actual instruction in the trades have been introduced into many high schools. Seven lines of work have been declared by the High School Teachers' Association to be essential: language, mathematics, history and civics, science, music, drawing and manual training. The length of the high school course is four years, and the usual age of pupils upon entrance is fourteen years. About 5 per cent of the students prepare for college. Many city high schools have evening classes for those unable to attend during the day.

Highways. See *Road.*

Hilary (hil'a-ri), St., one of the early fathers of the church, born at Poitiers, of which city, after his conversion from heathenism, he became the bishop about 350. His contests with the Arians caused his banishment to Phrygia, whence he returned after some years, and was an active diocesan till his death in 367.

Hilda (hil'da), Saint, a grandniece of Edwin, king of Northumbria, born about 614; died in 680. At the age of fourteen she was baptized by Paulinus. She was successively head of the abbey of Hartlepool and of the famous monastery at Whitby.

Hildesheim (hil'des-hīm), a city of Prussia, the see of a bishopric since 822. It retains splendid specimens of mediæval architecture. Pop. (1910) 50,246.

Hildreth (hil'dreth), Richard, historian, was born at Deerfield, Massachusetts, in 1807. He edited the *Boston Atlas*, was on the staff of the New York *Tribune* and published various works. He is best known, however, by his *History of the United States*, published 1849-52, and regarded as a standard work. He died at Florence, Italy, in 1865.

Hill, David Bennett, lawyer and statesman, born in Havana, New York, in 1843; died in 1910. He was admitted to practice of the law in 1864, was elected to the State legislature in 1870, and made lieutenant-governor of New York in 1882, succeeding Mr. Cleveland as governor when the latter became President. He was nominated and elected governor by the Democratic party in 1885 and again in 1888, and was made United States Senator in 1891. He was a prominent candidate for the presidential nomination in 1892, and in 1904 practically controlled the Democratic presidential nomination.

Hill, David Jayne, educator, born at Plainfield, New Jersey, in 1850. He was professor of rhetoric at Bucknell University in 1877-79; president, 1879-88; and president of the University of Rochester, 1888-96. He was appointed first assistant United States Secretary of State in 1898 and ambassador to Germany in 1908. He wrote several works on rhetoric, biographies, etc.

Hill, James Jerome, railroad official and financier, born near Guelph, Canada, in 1838. He was engaged for years in railroad enterprises in the West and in 1890 became actively interested in building the Great Northern Railway, extending from Lake Superior to Puget Sound. He became president of the Great Northern system in 1893, and retired in 1907, remaining chairman of the board of directors. He was vice-president of the New York Chamber of Commerce. Died May 29, 1916.

Hill, Rowland, a popular preacher, notable for his humor and eccentricities, son of Sir Rowland Hill, Bart., of Hawkstone in Shropshire, was born in 1744; died in 1833. He was ordained in the Anglican Church, but embracing the views of the Calvinistic Methodists, he soon began to preach in barns and meeting-houses, and when they were too small or too distant, or not to be procured, in streets, fields, and highways. In 1783 he laid the foundation of Surrey Chapel in the Blackfriars Road, London, where he preached with great success every winter for about fifty years, making summer excursions to the provinces, where his preaching attracted immense crowds. He published sermons and other theological works, of which the best known are his *Village Dialogues.*

Hill, Rowland (Viscount Hill), a British general, nephew of the above, was born in 1772; died in 1842. He entered the army in his sixteenth

year, obtained the rank of captain in 1793, and became colonel of the 90th Regiment in 1800. He took part in the Egyptian campaign, and in 1806 was made major-general. He served with great distinction during the campaigns of Moore and Wellington in the Peninsula. In 1809 he became lieutenant-general; in 1812 he was made a K. B.; and in 1814, on being made a peer by the

Viscount Hill.

title of Baron of Almarez and of Hawkstone, Parliament voted him a perpetual pension of £2000. At Waterloo he commanded the right wing of the British, and he was personally thanked by Wellington for his services. In 1828 he was appointed commander-in-chief of the British army, a post which he held till 1842, when he retired and was made a viscount.

Hill, Sir Rowland, an English postal reformer, born at Kidderminster in 1795; died in 1879. He was engaged as a schoolmaster till 1833, shortly after which he was appointed secretary to the commissioners for the colonization of South Australia. In 1837 he published a pamphlet recommending the adoption of a low and uniform rate of postage throughout the United Kingdom. The scheme was approved by a committee of the House of Commons, which examined its details in 1838, and early in 1840 the penny postage system, which seems to have been originally proposed by Mr. James Chalmers of Dundee, was carried into effect with the assistance of Mr. Hill, who, for this purpose, received an appointment in the Treasury. In 1846 he received a public testimonial of the value of upwards of £13,000. In 1846, he was made secretary to the postmaster-general, and in 1854 chief secretary to the post-office. In 1860 he became K.C.B. He retired from the post-office four years later with a pension of £2000, besides a grant of £20,000 voted by parliament.

Hillah (hil'lä), a town of Asiatic Turkey, 60 miles south by west of Bagdad, on the Euphrates, among the ruins of ancient Babylon. It has good bazaars, and manufactories of silk and leather. The Euphrates is here crossed by a floating bridge. Pop. about 10,000.

Hillel (hil'el), a Jewish rabbi, born at Babylon about B.C. 112. He came to Jerusalem, it is said, at about forty years of age, became president of the Sanhedrim and founder of the school of Hillel. Shammai, another member of the Sanhedrim, became the head of a rival and hostile school. Hillel's party was the more liberal of the two, and became the dominant one.

Hillis, Newell Dwight (1858-), an American clergyman and author, born at Magnolia, Iowa, graduated from Lake Forest University in 1884. He was pastor of churches in Peoria, Evanston, and Chicago, Illinois, and was called to Plymouth Church (Congregational), Brooklyn, in 1899. Author of *A Man's Value to Society*, *Success through Self-Help*, etc.

Hillsboro, a city, county seat of Montgomery Co., Illinois. It has coal mines, zinc and lead smelters, brick works, etc. Pop. (1920) 5074.

Hillsboro, a city, county seat of Hill Co., Texas, 66 miles S. W. of Dallas, in a cotton section, with manufactures of cotton cloth, cottonseed oil, flour, advertising novelties, etc. Pop. (1920) 6952.

Hillsdale, a city, county seat of Hillsdale Co., Michigan, 90 miles S. W. of Detroit. Seat of Hillsdale College (nonsectarian; founded as Michigan Central College, at Spring Harbor, 1844). It has manufactures of internal combustion engines, electric farm lights, flour, condensed milk, fiber furniture, screens, etc. Pop. (1920) 5476.

Hill Tippera, a native state of India; area, 4086 sq. miles; pop. 229,613.

Hill-Tout, Charles (1858-), a Canadian educator and ethnologist, secretary of the Ethnological Survey of Canada. He was born in England; later removed to British Columbia. Author of *Native Races of British North America*, etc.

Hill Tribes, the name given collectively to the numer-

ous wild tribes inhabiting the mountainous regions of India.

Hilo (hē'lō), the chief town of the island of Hawaii, and the second largest in the Sandwich Islands. It has the only harbor on the E. side of Hawaii and considerable trade, there being large sugar plantations in its vicinity. Pop. 19,785.

Hilprecht (hil'prekt), HERMAN VOLRATH, archæologist, born at Hohenerxleben, Germany, in 1859. In 1886 he became professor of Semitic Philology at the University of Pennsylvania, and was the leader of several expeditions sent to explore the sites of ancient Babylon and other Asiatic cities. He gathered much valuable material, has written many papers on Babylonian and oriental subjects, and is a prominent authority in cuneiform writings. His work on the subject of texts from the Nippur library gave rise to a widespread controversy.

Himálaya (hi-mä'lā-ya, or him-a-lā'ya; Sanskrit, *Himálaya*, the abode of snow), a chain of snowy mountains in Asia, the most elevated on the earth, which separates the Indian Peninsula from the plateau of Tibet, between the 72d and 96th degrees of E. lon., or between the Indus on the west and the Brahmaputra on the east; length about 1500 miles, average breadth about 180 miles. The direction of the Himálaya range from the Indus is for great part of its length from northwest to southeast, after which it curves gradually to the east, or slightly to the northeast. The great plain of India, south of the Himálaya, has a general elevation of 1000 feet above the sea. The transition from this plain to the ascent of the range is marked in the northwest by a belt of dry porous ground broken up into numerous ravines. East of this the *Tarai*, a belt of sloping marsh land, occupies the same position. The *Tarai* is covered with forest and jungle, is crowded with wild animals, and is very malarious. Beyond this lies the Bhabar, a belt of a gravelly and sandy nature covered with forests of valuable timber-trees. The *dúns*, *maris*, or *dwars*, longitudinal valleys partly cultivated and partly yielding forest growth, occupy the space between the *Bhabar* and the slope of the Himálayas themselves. The general height of the Himálayas is double that of the Alps; the passes over the former ordinarily exceed, often by half a mile, the elevation of Mont Blanc. The Ibi-Gamin Pass in Garhwal, the highest of all, is 20,457 feet, the Mustagh 19,019 feet, the Parangla 18,500 feet, the Kronbrung 18,313 feet, and the Dura Ghât 17,750 feet high. There are several summits in the Himálaya which approach closely to double the absolute elevation of the highest of the Alps, and 120 of them are stated to be above 20,000 feet. The rivers of the Punjab ('Five Waters') spring from a portion of the great chain which may be considered a distinct group under the title of the Northwestern Himálaya. Some of the peaks here rise to a height of 24,000 to 25,000 feet; or to 28,278 feet if the Karakorum is regarded as part of the Himálayas. In the Central or Middle Himalayas rise the sources of the Ganges and Jumna, in a region regarded by the Hindus as holy ground. Farther eastward, in Nepal, is the highest part of the Himálaya, so far as it is known and measured. Dhawalagiri has an elevation of 26,826 feet, the Gaurisankar or Mount Everest, the highest known mountain in the world, is 29,002 feet; the Yassa group rises to the height of 26,680 feet, the Ibjibia group to 26,306. Going farther east, in Sikkim, or on its borders, we find Kanchinjinga, the western peak of which is 28,156 feet high, the eastern 27,815 feet, while the Kâbru ridge rises to 24,015 feet. Sikkim forms a comparatively narrow but interesting territory, walled in on three sides by stupendous mountains from 17,000 to 28,000 feet high. Here terminates the region of the Middle Himálaya, most of the streams from which unite in the Ganges. The Eastern Himálaya, which extends from Sikkim east to the Brahmaputra and completes the chain, sends all its waters to the last-named river, and is all comprised in Bhutan. A little to the east of Sikkim, Chamalari attains the height of 23,944 feet. About 250 miles further east a conspicuous group has been observed with two peaks, named the Gemini or Twins, 21,500 feet high. Thence towards the east the mountains sink rapidly, but the range may be traced beyond the right bank of the Brahmaputra. This stream, as well as the Indus, rises on the little-known north side of the Himálaya, their sources not being far apart. The snowy ridge of the Himálayas, as far as examined, consists everywhere of granite, with which are immediately associated gneiss and mica-slate, followed, in descending, by metamorphic and secondary rocks till we arrive at the more recent alluvial deposits. Earthquakes are still frequent within this region; and hot springs gush forth in abundance, even from beneath the snow. The limit of perpetual snow in the middle division (lon. 78° E.) is stated to be about 15,500 feet on the south side and 18,500 feet on the north-

ern. In Sikkim the snow-line descends on the south side to 14,500 feet, while on the north it rises to a level of 19,600 feet. Immense glaciers exist at various parts. The vegetation of the Himálayas is very rich, there being forests of pine, spruce, silver-fir, and deodar cedar at suitable elevations, with rhododendrons in rich profusion. Among the more characteristic animals are the yak, musk-deer, wild sheep, etc.

Himera (him'e-ra), an ancient Greek town on the N. coast of Sicily, the site of which is near the modern Termini. Here Gelon and Theron annihilated the army of Hamilcar the Carthaginian (480 B.C.). In 409 B.C. Hannibal, grandson of Hamilcar, razed the town to the ground.

Himyarites (him'yar-īts), a race or group of races in Arabia, regarded as descendants of Himyar, one of the mythical ancestors of the Arabs. According to tradition they became the dominant race in Yemen about 3000 years before Mohammed, and spread to the Euphrates on the one hand and Abyssinia on the other. Their most flourishing period appears to have been from about 100 B.C. till A.D. 629, when they succumbed to Mohammedanism. The *Himyaritic language*, not now spoken, formed, with the Arabic and Ethiopic, the southern branch of the Semitic family of tongues. During the last hundred years several hundreds of Himyaritic inscriptions have been collected, and deciphered by means of alphabets with the corresponding Arabic letters which had been preserved. The Mahrah tribes of S. Arabia are the direct descendants of the ancient Himyarites.

Hinckley (hink'lē), a town of England, partly in Warwickshire, but mostly in the county of Leicester. It lies 12 miles southwest of Leicester, and contains an ancient church. Pop. (1911) 12,838.

Hincmar (hink'mar), Archbishop of Rheims, ecclesiastic and statesman, was born about 806; died at Epernay 882. He was at first a monk in the Abbey of St. Denis. In 845 he was elected archbishop of Rheims, where he exercised extensive political as well as ecclesiastical authority. He was a man of enlightenment, one of the best scholars of his age, and was distinguished as a defender of the liberties of the church. He wrote two treatises on Predestination, and numerous other works.

Hind (hīnd), the female of the stag, or red-deer. See *Deer*.

Hindenburg, PAUL VON, German Field Marshal, was born at Posen in 1847. He entered the army, was decorated for courage at Sadowa, 1866, and also in the Franco-Prussian War, 1870. Placed on the General Staff, he was made major-general in 1900, lieutenant-general in 1903, and retired in 1911. He re-entered the army in 1914, won the victory of Tannenberg, defeating the Russians with great loss, and in November was made field marshal. In 1916 he was placed in supreme command over the eastern front, and on August 20 succeeded General von Falkenhayn as chief of the General Staff.

Hindi (hin'di), one of the languages of India, being that form of Hindustani which employs the Devenágari or Sanskirt character.

Hindley (hind'lē), a town of England, in Lancashire, giving name to one of the parliamentary districts of S. W. Lancashire. Cotton manufacture is the chief industry, and coal abounds in the vicinity. Pop. 24,106.

Hinduism. See *Brahmanism*.

Hindu Kush (hin'dö kösh), or INDIAN CAUCASUS, a mountain system of Central Asia. It is generally considered as a continuation of the Himálayas, which it adjoins at the Indus, and then stretches west till it unites with the Ghur Mountains in North Afghanistan. Its culminating point, in the range of Hindu-Koh, to the north of Cabul, is said to be about 20,000 feet. In many features the Hindu Kush resembles the Himálayas proper, though it is lower and without forests.

Hindus, or HINDOOS. See *India*.

Hindustan (hin-du-stän'), the name commonly given to the whole Indian empire, properly applies only to the Punjab and the valley of the Ganges.

Hindustani (hin-dus-ta'nē), one of the chief languages of India, having various forms or dialects.

Hingham (hing'am), a residential town (township) of Plymouth Co., Massachusetts, on Massachusetts Bay, 17 miles S. E. of Boston, with a good harbor. Pop. (1920) 5604.

Hiogo (hyō'gō), a seaport of Japan, part of the town of Kobé, on the Bay of Osaka, 40 miles S. W. of Kioto. Pop. with Kobé (1916) 498,317.

Hiouen-Thsang (voo'en-tsang), a Chinese traveler and Buddhist priest, born about A. D. 602; died in 664. He wrote travels in India, and translated many Hindu books on Buddhism into Chinese.

Hip, the fruit of the dog-rose or wild-brier. It contains tannin, sugar, citric and malic acids, and is sometimes used in making conserves.

Hip-joint, the joint of the hip, a ball-and-socket joint formed by the reception of the globular head of the femur or thigh-bone into the socket or acetabulum of the os innominatum. For flexion, extension, rotation, and strength combined, it is the most perfect joint in the body.

Hipparchus. See *Hippias.*

Hipparchus (hip-ar'kus), an ancient Greek astronomer, was born at Nicæa, in Bithynia, and lived about B.C. 160-125. He resided for some time at Rhodes, but afterwards went to Alexandria, then the great school of science. A commentary on Aratus is the only work of his extant. He first ascertained the true length of the year, discovered the precession of the equinoxes, determined the revolutions and mean motions of the planets, prepared a catalogue of the fixed stars, etc.

Hipparion (hip-ar'i-on), a fossil genus of the horse family, of the Upper Miocene and Pliocene periods. The members are distinguished by the fact that each foot possesses a single fully-developed toe, bordered by two functionless toes which do not touch the ground, but simply dangle on each side of the central toe. The hipparion was about the size of an ass, one American species being, however, about the size of a goat.

Hippias (hip'pi-as), ruler of Athens, son of Pisistratus, after whose death (B.C. 527) he assumed the government, in conjunction with his brother Hipparchus. The latter being assassinated while conducting a solemn procession to the temple of Minerva, Hippias seized the reins of the government alone, and revenged the death of his brother by imposing taxes on the people, selling offices, and putting to death all of whom he entertained the least suspicion. His tyranny became at last unbearable, and he was expelled from the city B.C. 570.

Hippo (hip'ō), sometimes called *Hippo Regius* to distinguish it from another town of the same name on the Carthaginian coast; an ancient Numidian city, the ruins of which still exist a short distance south of Bona in Algeria. It was the episcopal see of St. Augustine, and was destroyed by the Vandals in 430.

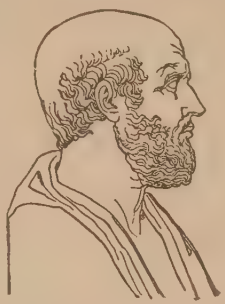
Hippoboscidæ (hip-u-bos'si-dē), a family of dipterous insects, parasitic on birds and quadrupeds. The type is the genus *Hippobosca* or horse-fly.

Hippocampus (hip-u-kam'pus), a genus of fishes, closely allied to the pipe-fishes, of singular construction and peculiar habits; the upper parts have some resemblance to the head and neck of a horse in miniature, which has suggested the name. When swimming they maintain a vertical position; their general length is from 6 to 10 inches, and they occur in the Mediterranean and Atlantic.

Hippocampus.

Hippocras (hip'u-kras), a medicinal drink, composed of wine (generally a mixture of Lisbon and Canary), with an infusion of mixed spices and other ingredients, formerly much used in England, and still common on the continent.

Hippocrates (hi-pok'ra-tēz), the most famous among the Greek physicians, the father of medicine, born in the island of Cos, B.C. 460. Besides practicing and teaching his profession at home he traveled on the continent of Greece, and died at an advanced age, B.C. 357, at Larissa, in Thessaly. His writings, which were early celebrated, became the nucleus of a collection of medical treatises by a number of authors of different places and periods, which were long attributed to him, and still bear his name. The best edition is that of Littré (in ten vols. 8vo, Paris, 1839-61). Among his genuine writings are the first and third books on epidemics; the aphorisms; on diet in acute diseases; on air, waters, and localities; on prognostics; on wounds of the head. Hippocrates was one of the first to insist on the importance of diet and regimen in disease. He had remarkable skill in diagnosis, practiced auscultation, and taught the doctrine of 'critical days.'



Hippocrates.—Antique bust.

Hippocrene (hip-o-krē'nē: 'The Horse's Fountain'), a

spring on Mount Helicon, a mountain in Bœotia, consecrated to the Muses, the waters of which possessed the power of poetic inspiration. It is said to have risen from the ground when struck by the hoofs of Pegasus.

Hippodrome (hip′u-drōm), the Greek name for the public place where the horse and chariot races were held. In Byzantine times the hippodrome at Constantinople acquired great renown, and factions originating in the hippodrome caused perpetual confusion in all departments of the public service. The name is sometimes applied to a modern circus.

Hippogriff (hip′u-grif), a fabulous animal or monster, half horse and half griffin.

Hippolytus (hip-pol′i-tus), in Greek mythology, son of Theseus, whose stepmother, Phædra, fell in love with him, and accused him to his father in order to revenge herself for his indifference. He was put to death, but his innocence being afterwards established, Phædra destroyed herself. See *Phædra.*

Hippolytus, an early Christian bishop and writer, the details of whose history are involved in obscurity. He appears to have lived about the beginning of the third century, and is supposed to have suffered martyrdom under Alexander Severus. The most important of his writings is the *Philosophumena,* a refutation of heresies, discovered in 1842.

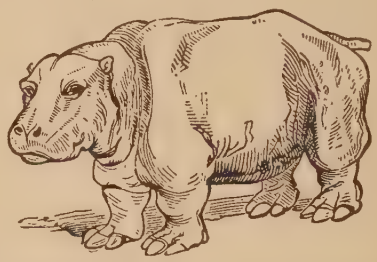
Hippomane (hip-om′ān), a genus of plants belonging to the Euphorbiaceæ. The *H. Mancinella* is the manchineel.

Hipponax (hip-po′naks), a Greek poet, born at Ephesus in 540 B.C., of whose works only a fragment of 100 lines remains. He was deformed in person, was banished from Ephesus for his satirical raillery, and lived in extreme poverty.

Hipponoüs. See *Bellerophon.*

Hippophagy (hi-pof′a-gi), the practice of feeding on horse flesh. Hippophagi was the name given by old geographers to certain nomadic Scythian tribes on the north of the Caspian Sea, who fed on horse flesh. Horse flesh has been eaten for a considerable time in Germany, and it has been regularly sold in Paris since 1866.

Hippopotamus (hip-po-pot′a-mus), the typical genus of a family of Ungulates, of which two living species are known. One species, *H. amphibius,* is of large size, and is common throughout the greater part of Africa; the other, *H. liberiensis,* is not only smaller, but has other important differences, and is found only in the African west coast rivers, and those flowing into Lake Tchad. The former species has a thick and square head, a very large muzzle, small eyes and ears, thick and heavy body, short legs terminated by four toes, a short tail, two ventral teats, skin about 2 inches thick on the back and sides, and without hair, except at the extremity of the tail. The incisors and canines of the lower jaw are of great strength and size, the canines or tusks being long and curved forward. These tusks sometimes reach the length of 2 feet and more, and weigh upwards of 6 lbs. The animal is killed by the natives partly as food, but also on account of the tusks and teeth, their hardness being superior to that of ivory, and less liable to turn yellow. The hippopotamus has been found of the length of 17 feet, and stands about 5 feet high. It delights in water, living in lakes, rivers, and estuaries, and feeding on water-plants or on the herbage growing near the water. It is an excellent swimmer and diver, and can remain under water a considerable time. The *behemoth* of Job is considered by commentators to be the hippopotamus, as the description of his size, manners, food, and haunts is not unlike those of the latter animal. Among the ancient Egyptians it was revered as a divinity, as it is among the negroes in some localities. Several extinct species are found in old-world tertiary and diluvial formations.



Hippopotamus (*Hippopotamus amphibius*)

Hippurites (hip-ur-ī′tēz), a genus of fossil bivalves, having the under shell of great depth, and of a conical form, with a flat lid or operculum, occurring in the lower chalk. They are allied to the living Chama, or gaping cockle. The *Hippurite limestone* is an important representative of the cretaceous rocks in the south of France and the

Pyrenees, characterized by a large admixture of shells of the family Hippuritidæ.

Hip-Roof, a roof, the ends of which slope so as to have the same inclination to the horizon as its other two sides.

Hiroshima (hē-ro-shē'ma), a commercial city of Japan, on the E. coast of Hondo. Pop. 142,763.

Hirschberg (hirsh'berh), a town of Prussia. Province of Silesia, 78 miles W. S. W. of Breslau. Pop. (1910) 20,560.

Hirsch, EMIL GUSTAV, was born in the independent grand-duchy of Luxemburg, in 1852, and after being educated in Germany, studied first at the University of Pennsylvania and then returned to Germany to continue his studies at the Universities of Berlin and Leipzig. He became a rabbi and minister of Har Sinai Congregation, Baltimore (1877). After holding other charges, he became professor of rabbinical literature and philosophy, University of Chicago. He was editor of the Biblical Department of the *Jewish Encyclopedia* (1903–06); has edited the *Zeitgeist* (Milwaukee), *Reform* (New York), and is now at the head of *Reform Advocate* (Chicago).

Hirsch, MAURICE, BARON DE, born in Munich, Bavaria, in 1831; died in 1896. He realized a vast fortune which he employed in bettering the condition of his race. He was a founder of the Jewish Colonization Society and gave it a capital of $10,000,000, subsequently increased by $35,000,000.

Hisgen (his'jen), THOMAS LOUIS, manufacturer, born at Petersburg, Indiana, in 1852. He settled in Springfield, Mass., where he engaged in the oil business and had a long fight with the Standard Oil Company. He was candidate of the Independence party for president in 1908.

Hissar (his-sär'), a town of Hindustan, in the Punjab, administrative headquarters of district of the same name. Pop. about 17,000. The district has an area of 3540 sq. miles. Pop. 780,000. Hissar is also the name of a district of Bokhara, in which large crops of grain and cotton are produced. The capital, Hissar, has about 10,000 population.

Histology (his-tol'ō-ji), the study of the tissues which enter into the formation of animals and plants, and their various organs, by means of the microscope and chemical and physical reagents. It may be described as a kind of minute anatomy. It comprehends the structure and mode of development of the various tissues, and is divided into animal histology and vegetable histology.

History (his'tu-ri; Greek *historia*, from *historeō*, I inquire into) is used by Herodotus in the sense which it has since retained, of a narrative of events and circumstances relating to man in his social or civic condition. A record of bare facts by themselves does not constitute history. Such a record (forming a chronicle or annals) is chronologically valuable; but to attain the dignity of history we must have social events and evolution detailed with considerable fullness, and the growth and movements of society, from one phase to another, distinctly traced and recorded. The modern school of historians devote much attention to the social life of the people; their method being further characterized by the utmost accuracy of research, the extreme importance assigned to contemporary documentary evidence, and careful weighing of data. The field of history proper is so far restricted as to its subject, that only the doings of a community possessing something of an independent organic life can constitute it. History may be conveniently divided into ancient, mediæval, and modern; but these divisions have little scientific value. The first includes the Jewish history and that of the nations of antiquity, reaching down to the destruction of the Roman Empire, A.D. 476; the second begins with 476 and comes down to the discovery of America in 1492, or to the Reformation; the third section extends from either of these eras to our own times. The earliest written history is found graven on the monuments of Egypt, Assyria, etc. These, though of the barest description, have the value of contemporary chronicles. Next come the histories found in the canonical books of the Old Testament; but the real inventors of the artistic form of history were the Greeks.

Hitchcock (hich'kok), EDWARD, a geologist, born at Deerfield, Massachusetts, in 1793; died in 1864. After being for four years minister of a Congregational church at Conway, Massachusetts, he was appointed in 1825 professor of chemistry and natural history at Amherst College, and in 1845 president of the same college, and professor of natural theology and geology. He was connected with the state survey of Massachusetts, Vermont, and part of New York, valuable reports on which he published. He was author of various other works, some geological and some of miscellaneous character. These include *Geology of the Connecticut Valley*, a highly popular work on *Elementary Geology*, *Illustrations of*

Surface Geology, Religion of Geology and its Connected Sciences, and *Reminiscences,* published shortly before his death.

Hitchcock, ETHAN ALLEN, diplomatist, born at East Machias, Maine, in 1835; died in 1909. He engaged in mercantile and corporation pursuits, was appointed United States minister to Russia, in 1897, and ambassador in 1898, and entered the McKinley cabinet as Secretary of the Interior in 1899, holding the same office under Roosevelt until March, 1907. He was active in bringing about the prosecution of those accused of defrauding the Indians.

Hitchin (hich'in), a market town of England, in Hertfordshire, 34 miles north of London. The parish church, St. Mary's, contains some fine brasses of the fourteenth, fifteenth and sixteenth centuries, and a notable altarpiece by Rubens. Many women are employed in straw-plaiting, and lavender is largely grown in the vicinity. Pop. 11,905.

Hitopadesa (h i t-ō-pa-dā'sha; Sanskrit, goodly instruction), an ancient Sanskrit work, taken from an older work called the *Panchatantra* or the five books, the source also of the collection known as the fables of Bidpai or Pilpay. The book consists of fables, one story growing out of another after the eastern fashion, with verses cited from ancient writers by the interlocutors, and was designed for the instruction of princes. It has been translated into many Asiatic and European languages.

Hittites (hit'īts), a Canaanitish nation first mentioned in connection with Abraham, who bought the field and cave of Machpelah from them. There are notices of them in Palestine during and after the captivity. Egyptian and Assyrian inscriptions seem to indicate that the nation consisted of a confederacy ruled by a number of chiefs, and many relics have been discovered within recent years, indicating that there was at one time a Hittite empire extending over a large area in Asia Minor and Syria. Their chief territory was in the Orontes Valley, and they seem to have played a prominent part in the history of Southwest Asia for a considerable period.

Hitu. See *Itu.*

Hivaoa (hē-va-ō'a), an island in the South Pacific Ocean, the largest of the southwestern group of the Marquesas; 22 miles long east to west; about 10 miles greatest breadth. It is mountainous, and bears indications of volcanic eruptions.

Hive. See *Apiary.*

Hivites (hī'vīts), a Canaanitish tribe first noticed in Gen., xxxiv. At the conquest of Canaan the main body occupied the northern confines of Western Palestine. Solomon subjected them to a regular tribute.

H'Lassa. See *Lassa.*

Hoadly (hōd'li), BENJAMIN, an English prelate, born in 1676; died in 1761. He was educated at Cambridge; took orders in 1700, and after being settled in London distinguished himself in controversy with Bishop Atterbury and others. A staunch low-churchman, he was appointed Bishop of Bangor, in 1715. A sermon preached before the king in 1717 gave rise to the 'Bangorian Controversy' regarding the divine authority of the king and the church. He was translated to the see of Hereford in 1721, to Salisbury in 1723, and Winchester in 1734.

Hoang-Ho (hō-ang-hō'), or YELLOW RIVER, a large river in China, the sources of which are in mountains in the Koko-Nor territory, north from Tibet. After a winding course of several hundred miles, it proceeds nearly due north to about lat. 41°; then east for nearly 200 miles, when it suddenly bends round, and flows directly south for about another 200 miles; then turns abruptly east, and flows in that direction till it reaches Lung-men-kau, when it diverges to the northeast, and falls into the Gulf of Pe-che-le, about lat. 37° 30′, and lon. 118° 30′. From the thirteenth century till 1853 the Hoang-Ho entered the sea in lat. 34°, south of the peninsula of Shan-tung, but at the latter date it took its present course. Since then vast sums have been spent in watching and strengthening the banks of the river, which is constantly overflowing at some point. In the autumn of 1887 the whole body of the river burst its banks about 300 miles from its mouth, and flooded about one-sixth of the province of Ho-nan, destroying towns and villages and causing a loss of life, the lowest estimate of which is one million. Its length is estimated at about 2600 miles. It derives its name from the vast quantities of yellow earth held in a state of solution by its waters.

Hoar (hōr), GEORGE FRISBIE, senator, was born at Concord, Massachusetts, in 1826; died in 1904. He graduated from Harvard College in 1846, and afterwards from the Dane Law School, Harvard. He practiced law at Worcester, was elected to the state legislature in 1852, to the state senate, 1857; was mem-

ber of Congress, 1869-77, and United States Senator from 1877 until his death. He served on the Tilden-Hayes Electoral Commission and was chairman of the Republican National Convention of 1880. He has left valuable memoirs of his observations during his long career.

Hoar-frost. See *Frost.*

Hoarhound. See *Horehound.*

Hoatzin (ho-at'zin), or HOACTZIN, *Opisthocŏmus cristātus*, a singular gregarious South American bird, sometimes called the *crested touraco*, referred by some naturalists to the family Cracidæ (curassows), order Gallinaceæ; by some made to form an order by itself (Opisthocomi); by others regarded as of the order Insessores, and allied to the plantain-eaters. The plumage is brown streaked with white, and the head has a movable crest. It is of the size of a pheasant, and has an enormous crop with a very small gizzard.

Hobart (hō'bȧrt), up to 1881 HOBART TOWN, the capital of Tasmania, situated at the foot of Mount Wellington (4166 ft.), on the river Derwent, about 12 miles from its mouth. The city is built in the form of a square, the streets crossing each other at right angles. Among the public buildings are the government house, the government offices, the houses of parliament, town-hall, post-office, museum, Episcopal and Roman Catholic cathedrals, and several other places of worship, many public and private schools, the general hospital, etc. There are several jam manufactories, breweries, flour-mills, tanneries, a woolen factory, etc.; and in connection with the shipping interest first-class patent slips. The harbor is easy of access, and has ample depth, capacity, wharf and dock accommodation. Pop. (1911) 27,526.

Hobart (hō'bart), GARRETT AUGUSTUS, Vice-President, was born at Long Branch, New Jersey, in 1844. He adopted the legal profession and was a member of the New Jersey legislature, 1873-85, being president of the senate, 1881-82. He became very prominent in Republican politics, and after being defeated for the United States Senate in 1884, was nominated for Vice-President, and elected for the term 1897-1901. He died November 1, 1899, before the completion of his term.

Hobbema (hob'be-ma), MEINDERT or MINDERHOUT, a Dutch landscape painter; born at Amsterdam in 1638; died in 1709.

Hobbes (hobz), THOMAS, an English moral and political philosopher, born in 1588 at Malmesbury; died in 1679. He was educated at Oxford, and afterwards traveled on the Continent as tutor in the Earl of Devonshire's family, becoming acquainted with Gassendi, Descartes, Galileo, etc. He was also intimate with Lord Bacon (some of whose works he translated into Latin), Lord Herbert of Cherbury and Ben Jonson. From 1637 to 1641 he resided much at Chatsworth, but becoming alarmed at the probability of political commotions, he went to Paris. He stayed abroad some years, and during that time published most of his works. He also taught mathematics to the Prince of Wales (Charles II), then in Paris, who after the restoration gave him a pension of £100. He spent his latter days with the Devonshire family. The most remarkable of his works is his *Leviathan, or the Matter, Form, and Power of a Commonwealth* (1651). Other works are *De Cive* (1642), *De Corpore Politico* (1650), *De Libertate, Necessitate et Casu* (1654), and *Behemoth*, a history of the Civil war, published after his death. He also published a metrical version of the *Iliad* and *Odyssey*. In the history of the development of freethought in Europe Hobbes holds an important place, and he was one of the first great English writers on government. He conceived the state of nature to be one in which all things are at war with one another, and government as the result of a compact, suggested by selfishness, for the sake of peace and protection. Absolute rule was the best form of government, but a ruler must afford protection to the subject.

Hoboken (hō'bō-ken), a city of Hudson Co., New Jersey, on the Hudson River, opposite New York, with which it is connected by tunnels and ferries. Several lines of transatlantic steamers sail from this port. During the World war, the six great piers of the Hamburg-American and North German Lloyd companies were taken over by the United States government and used as the principal port of embarkation for the American Expeditionary Forces. The city has manufactures of pencils, drafting instruments, electric lights, ships, steam engines, boilers, etc. It is the seat of Stevens Institute of Technology. Pop. (1910) 70,324; (1920) 68,166.

Hobson (hob'sun), RICHMOND PEARSON, naval officer, was born at Greensboro, Alabama, in 1870, and graduated from the naval academy in 1891. During the 1898 war with Spain he took a collier, the *Merrimac*, into the entrance of Santiago harbor, and sunk her in the channel, with the purpose of closing it against the Spanish squadron

in the harbor. He and his companions escaped in a small boat and surrendered to the Spanish commander. For this he was promoted first naval constructor. He resigned and was elected to Congress, 1906, where he strongly insisted on the danger of war with Japan.

Hobson's Choice, a choice without an alternative; that which is tendered, or nothing; the one thing or none. This phrase is said to have originated from one Hobson, a livery-stable keeper at Cambridge, England, who obliged each customer requiring the hire of a horse to take the next in turn, or that which stood nearest the stable-door.

Hoche (ōsh), LAZARE, general in the French revolutionary war, born in 1768. He took service in the French guards when sixteen years old, and at the revolution joined the popular party. He greatly distinguished himself at the siege of Thionville and the defense of Dunkirk, and shortly afterwards, when scarcely twenty-five years of age, received the command of the army on the Moselle. In 1793 he drove the Austrians out of Alsace, and soon after was arrested by the Jacobins and imprisoned at Paris. In 1794 he was released, and appointed commander of the army destined to quell the rising in the west, and afterwards to that in La Vendée. In 1796 he conceived the plan of attacking Britain, by making a descent on Ireland. He accordingly set sail in December from Brest, but the expedition utterly failed, and he was obliged to return without having even effected a landing. After his return he received the command of the army of the Sambre and Meuse. He opened the campaign of 1797 by a bold passage over the Rhine, and had defeated the Austrians in several engagements, when he was stopped in the path of victory by the news of the armistice concluded in Italy. He died suddenly in September of the same year (1797).

Hochst (hökst), a town of Prussia, in Hesse-Nassau, 6 miles W. of Frankfort. It has varied industries. Pop. 14,121.

Hochstädt (hōh'stet), Bavaria, the scene of battle of Blenheim in 1704. Pop. 2471.

Hock, the name given to the German wines grown in the Hochheim district. It is a white still wine, but is sometimes rendered sparkling. The name is also applied to all the Rhenish wines.

Hockey (hok'i), a game at ball known as *shinty* in Scotland, and *hurling* in Ireland. It is played with a club curved at the lower end, by a number of persons divided into two parties or sides; and the object of each side is to drive the ball into that part of the field marked off as their opponents' goal. In Canada and the northern United States it is played commonly in the winter on ice.

Ice Hockey, however, is more scientific than the old shinty and arose in Canada about 1880. It was introduced into the United States by some of these Canadian college players (1894–95), and the game has become very popular in America. The game requires a rink 112 ft. long and 58 ft. broad, and boundary boards, preferably 36 in. high, for carroming. A vulcanized rubber disc, 1 in. thick and 3 in. in diameter, known as a puck, is advanced by pushing or lifting with hockey sticks about four feet long, terminating in a blade set at an angle of about 45° with the haft. This blade may not be more than 3 inches wide. The object of the game is to drive the puck into the opponents' goal, which counts as one goal. The goals consist of pockets of netting extending back from posts and are six feet wide and four feet high. The players are seven in number, consisting of four forwards and three for defense.

Hoe (hō), an instrument for cutting up weeds and loosening the earth in fields and gardens, in shape something like an adze, being a plate of iron, with an eye for a handle, which is set at a convenient angle with the plate. The Dutch hoe differs from the common hand hoe in having the cutting blade set like the blade of a spade. A *horse-hoe* is a frame wheel-mounted, and furnished with ranges of shares spaced so as to work in the intervals between the rows of turnips, potatoes, etc. It is used on farms for the same purpose as the hand hoe, and worked by horse-power.

Hoe, RICHARD MARSH, inventor, born at New York in 1812; died in 1886. He invented in 1846 a rotary printing press, and subsequently the Hoe web-perfecting press. These inventions made a revolution in the art of newspaper printing, to which they were specially adapted.

Hof (hōf), a town in Bavaria, Upper Franconia, on the left bank of the Saale, 30 miles N. N. E. of Baireuth. It has woolen, linen, cotton, leather and paper manufactures. Marble and ironstone are worked in the vicinity. Pop. (1910) 41,126.

Hofer (ho'fer), ANDREAS, a Tyrolese patriot, born in 1767. In 1796 he led a rifle company against the French on Lake Garda, and after the Peace of Lunéville took a prominent part in the

organization of the Tyrol militia. In 1809 he took the lead in an insurrection of the Tyrolese for shaking off the yoke of Bavaria, to which their country had been transferred by the Treaty of Presburg. In a short time, with intermittent assistance from the Austrians, he defeated the French and Bavarian troops, and nearly the whole country was liberated. Hofer then carried on the military and civil administration, under the most singular circumstances, till the Peace of Vienna was proclaimed. Misled by false reports he commenced hostilities anew, and thus forfeited the protection of the amnesty. He remained concealed for some time, but was at last betrayed to the French, and carried to Mantua, where he was tried by a court-martial and shot, February 20, 1810. His family was indemnified for the loss of their property by the Emperor of Austria in 1819, and his son ennobled.

Hoffman (hof'man), CHARLES FENNO, poet and novelist, born at New York in 1806; died in 1884. He edited the *American Monthly Magazine* and the *New York Mirror;* published *Greyslaer*, a novel; *The Vigil of Faith, and other Poems;* and a number of songs, etc. During the last thirty years of his life he was afflicted with mental derangement. A complete edition of his poems was published by his nephew in 1874, with a critical introduction by W. C. Bryant.

Hoffmann, AUGUST HEINRICH, called also HOFFMANN VON FALLERSLEBEN, a German lyric poet and philologist, born at Fallersleben in Hanover in 1798; died at Corvey in 1874. Under the influence of the brothers Grimm he took to investigating old German literature, and became professor of German literature at Breslau in 1835. He also made special studies of Dutch and Silesian literature. He was dismissed in 1842 for the supposed revolutionary tendencies of his songs, and led a wandering life for some years. In 1860 he became librarian to the Duke of Ratibor. He published several volumes of songs, and works on the German language and literature.

Hoffmann, ERNST THEODOR AMADEUS, or, properly, ERNST THEODOR WILHELM, a German novelist, was born at Königsberg in 1776, where he studied law. He afterwards held several minor judicial appointments under government, and died in 1822, intemperate habits having ruined his health. He cultivated music and art, especially caricature, with success. Among his works of fiction are the *Phantasiestücke in Callot's Manier* (1814); *Die Elixire des Teufels* (1816); the *Nachtstücke* (1817); the *Serapionsbrüdere*, etc.

Hofmann, JOSEPH, celebrated pianist, was born at Cracow, Gallicia, in 1877, and became so proficient under the tutelage of his father, who was a capellmeister and composer, that at the age of 10 he made a concert tour of America. The infant prodigy developed into a brilliant player following a period of retirement and further study in Europe. He returned to the United States in 1901 and made an instant success.

Hog, a general name for the ungulate or hoofed animals of the genus *Sus*, or swine. The head is prolonged into a pointed or truncated snout; the feet have four toes, two of which reach the ground, and the skin is very thick, and mostly covered with stiff bristles. The common hog (*Sus scrofa*), in a tame state, is almost universal, except in very high latitudes. The prevailing color of the domestic animal is a dull yellowish white, sometimes marked irregularly with black and sometimes totally black. It is omnivorous in its habits, devouring almost any vegetable or animal substance. It is also very prolific, has usually two litters in a year, a litter consisting of from ten to even twenty. Its flesh forms a material part of the food of mankind, though Jews are strictly enjoined not to eat it, and Mohammedans agree in this prohibition. Pork takes salt better than almost any other meat, and hence forms an important article in military and naval stores. The lard of the hog is employed in a variety of preparations, and the bristles are used in large quantities in the manufacture of brushes, while the skin, when tanned, is used by saddlers, bookbinders, etc. The hog is erroneously looked on as a peculiarly stupid and gluttonous animal; it has also an undeserved reputation for filthy habits, but the too common filthiness of pig-sties is more the fault of the owner than the tenant. It wallows in the mire, but this is a peculiarity of the pachydermata, to cool themselves and provide a protection against insects. The wild-boar, from which most of our domesticated varieties are derived, is found in most parts of Europe and Asia. In size the wild animal considerably exceeds the domesticated hog, the legs are longer and more muscular, and the back therefore much higher. Hunting this animal has always been a favorite amusement, and can still be practiced in various parts of Europe. The wild hogs of Hindustan, which afford the amusement of 'pig-sticking' to the British resident there, belong to the species *S.*

cristātus, closely allied to the European wild-boar. Another species is found in Southeastern Asia, Java and various islands, and distinct from it is the Guinea hog of W. Africa, which is also said to have been naturalized in Brazil. As allied to the hog may be mentioned the *Babyroussa*, the genus *Phacochœrus*, or wart-hogs and the peccaries. In 1910 there were on American farms 44,158,000 hogs; 56,044,000 in 1912; 55,298,000 in 1914. On March 31, 1918, there were on American farms 74,324,000 hogs, valued at the enormous sum of $2,500,000,000, by far the greatest number produced in a single year. Hog cholera (see *Swine Fever*) was up till recently responsible for heavy loss among swine, but thanks to the efforts of Congress the disease is gradually being stamped out. Constantly increasing appropriations of Congress permitted the cholera-control demonstration work to be extended to thirty-five states in 1918. The loss in 1914 from hog cholera was 119 per thousand; this was reduced in 1917 to 42 per thousand, a saving of $45,000,000. According to the Federal Bureau of Crop Estimates, the mortality due to hog cholera in 1917 was the lowest ever recorded in America. The profitable production of hogs demands dry, sanitary, comfortable housing. The movable type of hog house.

Hogarth (hō'garth), William, painter and satirical artist, born at London in 1697; died in 1764. He was apprenticed to a silversmith, who employed him in engraving ciphers and crests on spoons and pieces of plate. In 1720 he commenced business for himself, painting portraits, and making designs and book-plates for the booksellers, etc. Among these was a series of illustrations to Hudibras. Besides portraits, he also painted miscellaneous subjects in oil. In 1729 he married the daughter of Sir James Thornhill, the painter, against her father's wishes, who is said, however, to have been mollified when Hogarth produced his celebrated series of pictures called the *Harlot's Progress*, a work which brought his great powers fairly before the public. The engravings of these, which became exceedingly popular, were published in 1734. This was followed by the *Rake's Progress* and *Marriage à la Mode*, two similar series of paintings and engravings; *Industry and Idleness, Beer Street and Gin Lane, The Election, The Enraged Musician, The Country-Inn Yard, The March to Finchley, Strolling Actresses Dressing in a Barn, Four Stages of Cruelty*, and a host of other engravings, which all evinced his extraordinary powers of satire, wit and imagination. Several portraits, notably those of himself, Garrick, Lovat and Wilkes, are masterpieces in their way. He was also ambitious of shining as an historical painter, but in this line he was not so successful. In 1753 his work on the *Analysis of Beauty* appeared, a treatise which brought him little fame, and which was severely ridiculed by his enemies and professional rivals. In originality of imagination and invention, and for vigor of realism and dramatic power, Hogarth stands in the highest rank, and his genius was always enlisted on the side of virtue and morality. Though best known as an engraver, he possessed high qualities as a painter. The best edition of his works is that published by Boydell (London, 1790), the plates of which, retouched by Heath and others, have been repeatedly published since.

Hog-deer. See *Axis*.

Hog-fish, the popular name given to teleostean fishes of the genus *Scorpæna*, family Scorpænidæ or Triglidæ. The best known species is the *S. scrofa*, common in the Mediterranean, having the head flattened sideways, armed with spines, and adorned with membranous lobes or filaments. It is of a large size and a red color.

Hogg, James, more familiarly known by the name of the *Ettrick Shepherd*, was born in Selkirkshire, Scotland, in 1770; died at Altrive, on the Yarrow, in 1835. After receiving a very scanty education, he began to earn his bread by daily labor as a shepherd. His early rhymings brought him under the notice of Sir Walter Scott, by whose advice he published a volume of ballads under the title of *The Mountain Bard*. The failure of an ill-judged agricultural scheme brought him to Edinburgh, where he published the *Forest Minstrel* (1810), and started a weekly periodical entitled *The Spy*, which, after a short time, became defunct. The appearance of the *Queen's Wake*, in 1813, with its charming ballad of *Kilmeny*, established Hogg's reputation as a poet. In 1815 he published his *Pilgrims of the Sun*, which was followed by *Mador of the Moor*, the *Poetic Mirror* (a collection of imitations of living poets), *Queen Hynde*, and *Dramatic Tales*, as well as by *The Brownie of Bodsbeck*, and other prose tales; the *Jacobite Relics* (partly written by Hogg), etc. From 1817 he had held the farm of Altrive from the Duke of Buccleuch at a merely nominal rent; but his farming schemes never throve, and he was generally in narrow circumstances.

Hog Island, a small tract of land, southwest of Philadelphia, which became famous during the great war of 1914-18. Here, in September, 1917, was established under the direction of the United States Shipping Board, the largest shipbuilding plant in the world. There were 50 slipways extending over a mile of water front. Outfitting piers, 1000 feet long, were also built. The land taken over by the government was 846 acres of virgin soil.

Hog-plum, the popular name of the plants belonging to the genus *Spondias*, nat. order Anacardiaceæ. Some of the species yield pleasant fruits, as *S. purpurea* and *S. lutea* of the West Indies, the species generally called hog-plum, because their fruit is a common food for hogs.

Hogshead, measure of capacity containing 63 old wine gallons, or 52½ imperial gallons. For beer it was 54 gallons, for rum 45 to 50 gallons, for brandy 45 to 60 gallons. Now seldom used in Britain, in the United States the word has come to signify a large cask. For tobacco it varies from 750 lbs. in some states, to 1200 lbs. in others.

Hohenlinden (hō-en-lin'den), a village of Bavaria, 20 miles east of Munich, celebrated for the victory gained by the French under Moreau over the Austrians under the Archduke John, December 3, 1800.

Hohenlohe (hō'en-lō-e), formerly a principality of Germany, containing 680 square miles, now chiefly under the sovereignty of Würtemberg, and partly under that of Bavaria.

Hohenstaufen (hō'en-stou-fn), a German princely family, several members of which filled the imperial throne. The founder of the family was Frederick, lord of Hohenstaufen, a castle in the Suabian Alps, who, for his services to the Emperor Henry IV, received the duchy of Suabia, and the hand of his daughter Agnes. His son Conrad was elected emperor in 1138. After the death of Conrad (1152) the confidence which was felt in the Hohenstaufen family caused the choice to fall on his nephew, Frederick III of Suabia, who was followed by Henry VI (1190), who added by his wife the kingdom of Sicily and Naples to the hereditary dominions of the family; and he again by Otto IV (1197) and Frederick II (1215-50), all belonging to the same house. After the death of Frederick II his son Conrad was acknowledged as his successor, with the title of Conrad IV, by most of the states of the empire; but Innocent IV laid him under an interdict, declared him to be deprived of all his lands, and persecuted him with relentless hatred till his death in 1254. The possessions of the family ultimately fell to Bavaria, Baden and Würtemberg.

Hohenstein-Ernstthal (hō'en-shtīn ernst'täl), a town in Germany, kingdom of Saxony, 12 miles N.E. of Zwickau. Pop. (1910) 15,632.

Hohenzollern (hō-en-tsol'ĕrn), two united principalities of Germany, since 1852 an administrative division of Prussia. It consists of a long, narrow, irregular strip of country, entirely surrounded by Würtemberg and Baden. Area, 441 square miles. Pop. 71,009. The princely family of Hohenzollern dates from Tassillon, who lived under Charlemagne, 800 A.D. There have been several lines and branches, the main one being represented by the last emperor of Germany, William II (q. v.).

Höhscheid (hē'shīt), commonly Rhenish province, Prussia, w. of Barmen. Its industries include lead-mining, and the manufacture of cutlery and hardware. Pop. (1910) 16,083.

Hokusai (hō'kō-sī), a celebrated Japanese painter, born at Honjo in Yedo (now Tokio) in 1760; died in 1849. No less than 30,000 drawings are accredited to him.

Holacanthus. See *Coral Fishes.*

Holbach (hol'bȧh), Paul Heinrich Dietrich, Baron von, philosopher, born at Heidelsheim, in the Palatinate, in 1723; died in 1789. In Paris he became the patron and associate of the encyclopædists, and contributed many papers to the *Encyclopédie.* The principal work attributed to him, which appeared under the name of M. Mirabaud, is the *Système de la Nature.* He afterwards published *Système Social, or Principes Naturels de la Morale et de la Politique: Bons Sens,* or *Idées Naturelles opposées aux Idées Surnaturelles*—a sort of atheist's catechism; *Eléments de la Morale Universelle;* etc., etc. According to Holbach's teaching matter is the only form of existence, and everything is the effect of blind necessity.

Holbein (hol'bīn), Hans, an eminent German painter, born at Augsburg in 1497. He studied under his father, Hans Holbein the elder, a painter of considerable merit (1450–1526), and at an early age settled at Basel, where he exercised his art till about 1526. He then came to England, where letters from his friend Erasmus,

whose *Panegyric on Folly* he had illustrated by a series of drawings, procured him the patronage of the chancellor Sir Thomas More. He was appointed court painter by Henry VIII; and painted many celebrities. His paintings include a

Hans Holbein the younger

Madonna at Darmstadt (better known through the replica at Dresden), representing the Burgomaster Meyer and his wives kneeling to the Virgin; and the *Solothurn Madonna*. His famous *Dance of Death* has been preserved only in the engravings of Lützelburger. There are a considerable number of engravings on wood and copper from Holbein's designs. He died at Whitehall of the plague in 1543.

Holberg (hol'bĕrg), Ludwig, Baron, the father of modern Danish literature, was born at Bergen, in Norway, then part of the Danish dominions, in 1684; died at Copenhagen in 1754. He studied at the University of Copenhagen, and afterwards traveled through a good part of Europe, spending some time in Oxford, where he taught music and modern languages, and studied modern history and philosophy. In 1718 he was appointed to an ordinary professorship in the University of Copenhagen, where after this date he chiefly resided till his death. In 1735 he was elected rector, and in 1737 treasurer of the university in which he held his professorship, and in 1747 he was raised to the rank of baron. His works may be divided into four classes—poems, stage pieces, philosophical treatises and historical works. His poems are chiefly of a satirical nature. The most celebrated is *Peder Paars*, a comic heroic poem in fourteen cantos, which is still regarded throughout the Scandinavian countries as a masterpiece. Almost equally famous is his *Nicolas Klimm's Subterraneous Travels*, a satirical romance in prose. His stage pieces are all either comedies or farces, and are nearly all characterized by true comic power. Among his philosophical writings the most important is his *Moral Reflections* (1744). His historical works include *The Political, Ecclesiastical, and Geographical Condition of the Danish Monarchy, A General History of the Jews*, and *A History of Famous Men and Famous Women* (1739-45).

Holcus (hol'kus), a genus of grasses (nat. order Gramineæ), extremely common in some pastures, where they are called soft grasses. Whether because of their innutritious quality, or of the soft hairs with which they are covered, they are neglected by cattle. *H. saccharatus* contains a large quantity of sugar, and *H. odorātus* is celebrated for its fragrance. *H. lanatus* is the only North American species.

Hold (hōld), the whole interior cavity or belly of a ship, or all that part of her inside which is comprehended between the floor and the lower deck throughout her length.

Holden, Edward Singleton, astronomer, born at St. Louis, Missouri, in 1846. He was professor of mathematics at the Naval Academy, 1873-81; president of the University of California, 1883-88; director of the Lick Observatory, 1888-98; afterwards astronomer of the Smithsonian Institution, and since 1901 librarian of the United States Military Academy. He has written many papers on astronomical and other subjects.

Holibut. See *Halibut*.

Holiday (hol'i-dā), any day set apart as a religious or national festival; in a general sense a day or a number of days during which a person is released from his everyday labors. In Britain certain days were fixed as bank-holidays by Parliament in 1871, and it was enacted that all business transactions which would have been valid on any such holiday shall be held as valid if performed on the day following. In most sections of the United States the holidays are New Year's Day, Lincoln's Birthday, Washington's Birthday, Good Friday, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas. Other countries have patriotic holidays of historical significance to them, with various church and other holidays, while New Year's Day, Good

Friday and Christmas are kept as holidays throughout Christendom.

Holinshed (hol'inz-hed), RAPHAEL (RALPH), an English chronicler of whom nothing more is known than that he was descended from a family originally belonging to Cheshire, that he lived in the age of Queen Elizabeth, and that he died about 1580. He is only known by his *Chronicles of Englande, Scotlande and Irelande*, the first edition of which, known as the 'Shakespere edition,' because it is the one which is supposed to have been used by him in collecting material for his historical plays, was published in London in 1577. In the preparation of this work Holinshed was assisted by several of the most learned men of the day.

Holkar (hol'kär), the family name of the Maharajahs of Indore.

Holl (hol), FRANK, portrait and subject painter, son of Francis Holl, an eminent engraver, was born at London in 1845; died in 1888. He was a very successful student at the Royal Academy, and exhibited constantly from his student days. Among his best-known pictures are *Faces in the Fire*, *Fern-gatherers*, *No Tidings from the Sea*, *Leaving Home*, and *Gifts of the Fairies*. Later he devoted himself to portraiture, in which he greatly excelled, and painted many of the celebrities of the day.

Holland (hol'land), a fine and close kind of linen, so called from its first being manufactured in Holland; also a coarser linen fabric, unbleached or dyed brown, used for covering furniture, carpets, etc.

Holland, a city of Ottawa County, Michigan, 25 miles S. W. of Grand Rapids. It has extensive leather works, large woodenware and furniture factories, etc., and is a prominent grain market. It is the seat of Hope College and Western Theological Seminary. Pop. (1920) 12,166.

Holland, HENRY RICHARD VASSALL FOX, THIRD LORD, born in 1773; died in 1840. He succeeded to the peerage by the death of his father when less than one year old. In 1798 he took his place in the House of Lords, and as the nephew of Charles James Fox was at once acknowledged as a Whig leader, and a very able orator. In 1806 he was commissioner for settling disputes with the United States; lord privy seal in 1806-07; and chancellor of the Duchy of Lancaster. He wrote *Life of Lope de Vega* and *Foreign Reminiscences*, published *Three Comedies from the Spanish*, and made Holland House the resort of the wit, talent and beauty of his day.

Holland, JOSIAH GUILBERT, author and editor, was born at Belchertown, Massachusetts, in 1819. In 1844 he was graduated at the Berkshire Medical College, but in his practice received but little encouragement. At the age of 30 he connected himself with the Springfield *Republican*. Dr. Holland exhibited remarkable aptitude for journalism, and the paper soon became vastly popular. As an author many of his works were very successful, with immense sales. Prominent among them were *Bittersweet, a Dramatic Poem; Sevenoaks*, *Miss Guilbert's Career*, and *Nicholas Mintum*, novels, and *History of Western Massachusetts*. In 1870 Dr. Holland began editing *Scribner's Monthly*. He died in 1881.

Holland, KINGDOM OF. See *Netherlands*.

Holland, NEW, the name formerly given to the island or continent of Australia.

Holland, NORTH (*Noordholland*), and HOLLAND, SOUTH (*Suidholland*), two provinces of the Netherlands. The greater part of the former consists of a peninsula, bounded by the North Sea on the W. and the Zuider Zee on the E. Area, 1054 sq. miles. It lies very low, some portions of it being at least partially below the level of the sea, and is generally fertile. A broad margin of downs or sand-hills protects it from the sea on the west. Besides rivers (Vecht, Amstel, Zaan, etc.), it is intersected by the North Holland Canal, the North Sea Canal, and other waterways. The capital is Haarlem; largest city, Amsterdam. Pop. 1,176,450.—SOUTH HOLLAND, the most populous province of the Netherlands, is bounded on the north by North Holland, on the west by the North Sea. The southern part of the province is broken up into several islands. Area, 1166 sq. miles. Like North Holland, it is a flat and depressed tract, and it also is protected from the sea on the west by a margin of downs or sand-hills. The chief river is the Rhine, with its numerous branches. The lakes were formerly numerous, but most of them are now drained. The soil is fertile and well cultivated. The principal towns are Delft, Dort, Gorkum, Gouda, Leyden, Rotterdam, Schiedam, s'Gravenhage (The Hague). Pop. 1,502,100. See *Netherlands*.

Holland, PHILEMON, physician, teacher, and 'translator-general of his age,' born at Chelmsford, England, in 1551; died in 1636. He became master of the free grammar school of Coventry, and also practiced as a physician. His translations include Livy,

Pliny, Plutarch's Morals, Suetonius, Xenophon, etc., and he published an edition, with additions, of Camden's Britannia.

Hollands. See *Gin*

Hollar (hol'lär), Wenzel *or* Wenceslaus, a Bohemian engraver, born at Prague about 1607; died at London in 1677. He accompanied the Earl of Arundel, the British ambassador to the German emperor, to London, who employed him to engrave some of the pictures of his collection. Among his numerous works, which are esteemed for their delicate, firm, and spirited execution, and which number some 2740 plates, is a set of twenty-eight plates, entitled *Ornatus Muliebris Anglicanus*, representing the dresses of Englishwomen of all ranks and conditions in full length figures; Holbein's *Dance of Death*, etc.

Hollow Ware, the trade term for all kinds of vessels made of cast or wrought iron, and used for cooking and other purposes.

Holly (hol'i; *Ilex*), a genus of plants of the order Aquifoliaceæ, embracing a number of evergreen trees or shrubs. The common holly (*I. aquifolium*) is a native of Europe. It is a handsome, conical evergreen tree, growing to the height of 20 or 30 feet. Its leaves are dark-green, shining, and leathery, abundantly armed with prickles on the lower branches, but free from them on the upper, or on very old trees. The flowers are white, appearing in May, the fruit is red, ripening in September, and remaining on the tree all the winter. It is excellently adapted for hedges and fences, as it bears clipping. The wood is hard and white, and is employed for turnery work, knife handles, etc. The bark yields a mucilaginous substance, from which birdlime is made. Among the Romans it was customary to send boughs of holly to friends, with new-year's gifts, as emblematical of good wishes; and it is used to decorate houses at Christmas. The American holly (*Ilex opaca*) is widely diffused throughout the United States. It sometimes attains the height of 80 feet, with a trunk 4 feet in diameter. The *I. glabra* is another species of holly, inhabitating the coast regions of the United States. Its leaves furnished the 'black drink' which used to hold an important place in Indian ceremonies. The maté or Paraguay tea-plant is a species of holly (*I. Paraguayensis*).

Hollyhock (hol'i-hok), a perennial plant. (*Althœa rosea*), nat. order Malvaceæ. It is a native of Greece, and is a frequent ornament of gardens. There are many varieties, with single and double flowers, characterized by the tints of yellow, red, purple and dark purple approaching to black. It reaches a height of 8 feet or more.

Holmes (hōmz), Mary Jane (née Hawes), American author, born at Brookfield, Mass., in 1839; died 1907. She was one of the most popular of American novelists, over 2,000,000 copies of her books having been sold. Among her novels are *Dora Dean, Marion Gray, The Cromptons.*

Holmes (hōmz), Oliver Wendell, writer, born at Cambridge, Massachusetts, in 1809, and educated at Harvard University. He began the study of law, but in a short time relinquished it for that of medicine. In 1839 he became professor of anatomy and physiology in Dartmouth College, New Hampshire, but resigned after two years' service in order to devote himself to practice in Boston. In 1847 he was appointed to the chair of anatomy at Harvard, a position which he filled till 1882. As an author he was prolific both in prose and verse, and shone as a prominent figure in the famous group associated with the *Atlantic Monthly*. His chief works, besides several volumes of poems, and treatises on medicine, are *The Autocrat of the Breakfast Table, The Professor at the Breakfast Table,* and *The Poet at the Breakfast Table; Elsie Venner, The Guardian Angel, A Mortal Antipathy* and *Memoirs of Motley* and *Emerson.* He died October 7, 1894.

Holmes, Oliver Wendell, son of the above, born at Boston 1841; graduated from Harvard in 1861; from Harvard Law School in 1866; served in the Civil War, and was wounded at Ball's Bluff, Antietam and Fredericksburg. In 1867 he was admitted to the Massachusetts bar; became professor of law at Harvard 1882; chief justice Supreme Court of Massachusetts 1899–1902; associate justice Supreme Court of the United States 1902.

Holmes, William Henry, American geologist, born in Harrison County, Ohio, in 1846. In 1872 he became first assistant and then (1889) geologist to the United States Geological Survey. Since October, 1902, he has been chief of the Bureau of American Ethnology.

Holm-oak, *Quercus Ilex*, a shrub-like tree, native of the Mediterranean countries, with holly-like leaves. In its native countries it attains a considerable size and age.

Holofernes (hol-o-fer'nēz). See *Judith.*

OLIVER WENDELL HOLMES

The Poet's Birthplace and Study.

Successively law student, physician and Harvard professor of anatomy, Holmes' undying fame rests on his authorship. "The Autocrat of the Breakfast Table" was beloved for his geniality, of which these intimate photographs give some suggestion.

Holograph (hol'u-graf), any writing, as a letter, deed, will, etc., wholly written by the person from whom it bears to proceed. In Scots law a holograph deed is valid without the signatures of witnesses, but in English law every deed, whether holograph or not, must have the names of two witnesses attached to it to render it valid. The rule as to witnesses varies in the various states of this country.

Holoptychius (hol-op-tik'i-us), a genus of fossil ganoid fishes occurring in the upper old red sandstone. The head was covered with large plates, and the body with bony scales, rhombic or cycloid in form. The jaws, besides being armed with numerous sharp-pointed fish-teeth were furnished with large teeth of a conical form.

Holothuria (hol-o-thū'ri-a), the type of an order of Echinoderms, the *Holothurioidea* or sea-cucumbers. This order is destitute of the calcareous plates typical of the class, but has a leathery integument open at both ends, and pierced by orifices through which suctorial feet or ambulacra protrude. They have the mouth surrounded by tentacula; a long convoluted alimentary canal; respiratory organs near the anus, and generally in the form of two branching arborescent tubes (forming the 'respiratory tree') into which the water is admitted; and the organs of both sexes in each individual. They are capable of extending themselves to several times the length they have in a state of repose, and of extraordinary reproduction of parts, even of vital organs. The young undergo a metamorphosis during development. They abound in the Asiatic seas, the bêche-demer or trepang being a member of the family, and highly esteemed in China as an article of food.

Holst, Hermann, Eduard von, historian, born at Fellin, Livoisia (Russia), in 1841; removed to New York in 1864; was subsequently professor of history at Strasburg and Freiburg. He wrote a very able *Constitutional History of the United States*, also *Constitutional Law of the United States*, and *Life of J. C. Calhoun*. He died in 1904.

Holstein (hōl'stīn). See *Schleswig-Holstein*.

Holster (hōl'ster), a leathern case for a pistol, carried by a horseman at the fore part of his saddle, and frequently covered with wool or fur.

Holy Alliance, a league concluded at Paris, September 26, 1815, between Alexander I, emperor of Russia, Francis of Austria, and Frederick William III of Prussia, and signed with their own hands, and without the countersign of a minister. It consisted of a declaration, that, in accordance with the precepts of the gospel of Jesus Christ, the principles of justice, charity, and peace should be the basis of their internal administration, and of their international relations, and that the happiness and religious welfare of their subjects should be their great object. Its real aim, however, was to maintain the power and influence of the existing dynasties, and its methods were by no means in accordance with its title. It was offered for signature to all the European powers except the pope and the sultan of Turkey, and accepted by all except Britain. Its purpose of aiding Spain in subduing her American colonies, with the idea of acquiring for its members territory in America, was a leading cause of the promulgation of the Monroe Doctrine, which put a definite end to the scheme. The events of 1848 broke up the Holy Alliance.

Holy Coat of Treves, a relic preserved in the cathedral of Treves, and claimed to be the identical seamless coat worn by Jesus at his crucifixion, and for which the soldiers cast lots. It is said to have been brought from Palestine by the Empress Helena.

Holy Cross, College of the, a Roman Catholic college at Worcester, Mass.; controlled by the Fathers of the Society of Jesus; founded in 1843. in 1921 it had 700 students.

Holy Cross Mountain, situated in Colorado, in the heart of the Rocky Mts., about 15 m. N. W. of Leadville; height, 14,000 feet.

Holy Ghost, according to Trinitarians, the third Person in the Holy Trinity; according to the Socinians, a Biblical metaphor, to designate the divine influence. The doctrine of the Athanasian creed adopted by Roman Catholics, Lutherans, and Calvinists alike, is that the Holy Ghost proceeded from both Son and Father, and is coeternal and equal with both. The Eastern Church, however, following the Council of Alexandria held in 362, asserts that the Holy Ghost proceeds from the Father alone.

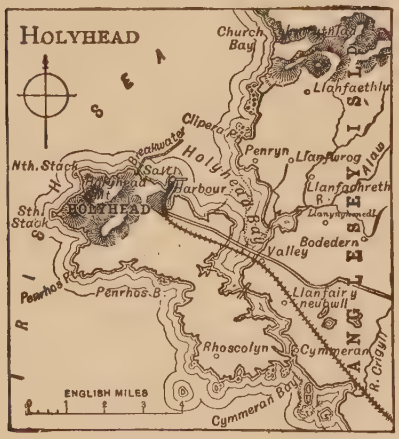
Holy Ghost, Order of, an order of male and female hospitallers, founded by Guy, son of William, Count of Montpellier, towards the end of the twelfth century, for the relief of the poor, the infirm and foundlings. After the middle of the eighteenth century it was united with the order of St. Lazarus by Clement XIII. This was also the

name of the principal military order in France instituted in 1578 by Henry III, abolished in 1789, revived at the Restoration, and again abolished in 1830.

Holy Grail. See *Grail*.

Holy Grass, *Hierochlŏe*, an odoriferous genus of grasses belonging to the Phalarideæ, and consisting of several species spread over the cold parts of both hemispheres. The *H. borealis*, or northern holy grass, is found in Scotland, Iceland, and throughout Northern Europe, Asia and America, and occurs also in New Zealand. It has its name from the practice adopted in some parts of Germany of strewing it before the doors of churches on festival days.

Holyhead (hol'i-hed), an island and seaport town of North Wales, in the county of Anglesey. The island is about 7 miles long and 5 miles broad at the widest part, is situated off



the west side of Anglesey, and is connected with the mainland by a causeway. The town is on the northeast side of the island, and owes its prosperity to the railway and steamboat traffic between England and Dublin. The harbor of refuge (Victoria Harbor), opened in 1873, is formed by a breakwater which is 7860 feet in length. Ropemaking and shipbuilding are leading industries. Pop. 10,638.

Holy Island, or LINDISFARNE, an island off the northeast coast of England, 11 miles southeast of Berwick. It is 1¾ miles from the mainland, with which it is connected by a narrow neck of sand, traversable at low water. It is of an irregular form, about 2¼ miles in length, and about 1½ miles in breadth at the broadest part. The village of Lindisfarne on the S. W. is much resorted to by summer visitors, but the great object of interest is the extensive ruined abbey of Lindisfarne, founded in 634 by Oswald, king of Northumbria, destroyed by the Danes, and restored by the Normans in 1093.

Holyoake (hōl'yōk or hō-li-ōk), GEORGE JACOB, English social reformer, born at Birmingham, 1817; died, 1906. In 1837 he fell under the influence of Robert Owen, and became (1841) one of his most active 'social missionaries.' His later years were devoted to the spread of secularism.

Holyoke (hōl'yōk), a city of Hampden county, Massachusetts, on the W. bank of the Connecticut River, 8 miles N. of Springfield. It is a prosperous manufacturing place, its rise dating from 1849, when a dam constructed across the river, which here falls 60 feet in the course of a mile, supplied it with extensive water power. It is extensively engaged in the manufacture of woolen and cotton goods, paper, thread, machinery and various other articles. Its paper industry is one of the largest in the world; also noted for its textiles. Pop. (1910) 57,730; (1920) 60,203.

Holy Orders. See *Orders, Holy*.

Holy Places of Jerusalem, a term meant to apply more particularly to that group of localities of which the Church of the Holy Sepulchre is the center, some of the other more celebrated objects being the Garden of Gethsemane, the Church of the Ascension, the Tomb of the Virgin, etc., all connected with the life and passion of our Saviour. The guardianship of the holy places has been a cause of much contention between the Greek and Latin churches. They were formerly under the control of the latter, but since 1757 they have been committed to the care of the Greek Church by imperial ordinance of the Porte. Demands made respecting the holy places and the protection of Greek Christians in Turkey, led to the Crimean war of 1854-56.

Holy Roman Empire, a title which the German Empire received in 962 when Otho I was crowned at Rome by Pope John XII. It came to an end when Francis II became hereditary emperor of Austria in 1804.

Holyrood (hol'i-rōd), PALACE AND ABBEY OF, in Edinburgh, at the eastern extremity of the old town. The abbey church, founded in 1128 by

David I, containing the royal vault, with the ashes of numerous members of the Scottish royal race, is now mostly in ruin. The palace is a large quadrangular building of hewn stone, with a court within surrounded by a piazza. It was erected in successive parts from 1501 to 1679, contains the private royal apartments in modernized condition, the rooms associated with the events in the reign of Mary, Queen of Scots, and a gallery 150 feet long, in which are portraits of all the Scottish kings, most of them imaginary. The abbey and its precincts possess the privilege of sanctuary for insolvent debtors, but the class of debtors entitled to sanctuary has been so restricted by recent legislation that the institution may be looked upon as obsolete.

Holy Sepulcher, KNIGHTS OF THE, an order of knighthood founded by Godfrey of Bouillon, 1099, for the guardianship of the Holy Sepulcher at Jerusalem, and for the protection of pilgrims. It was revived by Pope Alexander VI, 1496, and reorganized in 1847 and 1868.

Holy Spirit Plant, an orchidaceous plant (*Peristeria elata*) of Central America, known also as the *dove-plant*, from the resemblance of the united stamens and pistil of the flower to a dove hovering with expanded wings, somewhat like the conventional dove seen in artistic representations of the Holy Ghost. It has a spike of almost globose, sweet-scented flowers of a creamy white, dotted with lilac on the base of the lip.

Holy Thursday, Ascension-day, in the Anglican Church, a movable feast, always falling on the Thursday but one before Whitsuntide. In the Roman Catholic Church, the Thursday in Holy Week. See *Holy Week*.

Holy Wars. See *Crusades*.

Holy Water, in the Greek and Roman Catholic churches, salted water which has been consecrated by prayers, exorcism, and other ceremonies, to sprinkle the faithful and things used for the church. It is placed at the door of churches, so that worshipers may sprinkle themselves with it as they enter, and it is used in nearly every blessing which the church gives. Sprinkling the people with holy water seems to date from the ninth century, and it is considered efficacious not from any virtue of its own, but from the effect of the church's prayers at the time of using.

Holy Week, or PASSION WEEK, is that which immediately precedes Easter, and is devoted especially to commemorate the passion of our Lord. The days more especially solemnized during it are Spy Wednesday, Maundy Thursday, Good Friday and Holy Saturday. It is an institution of very early origin, and is known as Great Week, Silent Week, Penitential Week, etc. Spy Wednesday was a name given in allusion to the betrayal of Christ by Judas Iscariot. Maundy or Holy Thursday especially commemorates the institution of the Eucharist.

Holywell (hol'i-wel), parliamentary borough, Flintshire, North Wales, on the estuary of the Dee, 17 miles S. W. Liverpool. It takes its name from the well of St. Winifred, one of the most copious springs in Britain, long a famous resort for the supernatural cure of bodily disease and infirmity. The well is covered by a small Gothic building of early date. It formerly sent up 20 tons of water a minute, but its flow has decreased. Near the town are coal and lead mines, quarries, etc. Pop. 2549.

Homage (hom'ij), in feudal law, a formal acknowledgment made by a feudal tenant to and in presence of his lord on receiving the investiture of a fief or coming to it by succession, that he was his vassal. The tenant, being ungirt and uncovered, kneeled and held up both his hands betweeen those of the lord, who sat before him, and there professed that 'he did become his man, from that day forth, of life and limb, and earthly honor,' and then received a kiss from his lord.

Homburg (hom'burg), a town of Prussia, province of Hesse-Nassau, 9 miles N. N. W. Frankfort. It is well and regularly built, and is much frequented on account of the mineral springs and bathing establishment, to which gaming-tables were formerly attached. The waters are of two classes, those of three springs being purgative, and used for complaints of the stomach, liver, kidneys, etc.; those of the remaining two containing iron and being used as a tonic. Pop. (1905) 13,740.

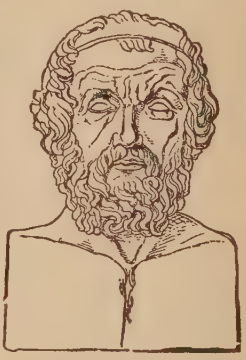
Home (hōm). DANIEL DOUGLAS, spiritualist, born near Edinburgh in 1833; died in 1886. He was brought when young to the United States, and as a youth became famous for his mediumistic powers. In 1855 he removed to Europe, where his remarkable manifestations excited great attention. He was especially notable from having convinced Sir William Crookes, the famous physicist, of the truth of spiritualism.

Home, HENRY, a Scottish lawyer and author, born in 1696; died in 1782. He studied law at Edinburgh, and was called to the bar in 1724. He soon acquired reputation by a number of publications on the civil and Scottish law. In 1752 he became a judge of session, and assumed the title of Lord Kames. In addition to his legal works he published *Essays on British Antiquities; Essays on the Principles of Morality and Natural Religion,* in which he advocates the doctrine of philosophical necessity; *Introduction to the Art of Thinking;* and his best-known work, *Elements of Criticism,* in which, discarding all arbitrary rules of literary composition, he endeavors to establish a new theory on the principles of human nature. In 1776 he published the *Gentleman Farmer;* and in 1781 *Loose Thoughts on Education.*

Home, JOHN, a Scottish clergyman and dramatic poet, born at Leith in 1722; died at Edinburgh in 1808. He studied for the church, and was appointed to the parish of Athelstaneford, vacant by the death of Blair, author of the Grave. His tragedy of *Douglas* was performed at Edinburgh in 1756, and attained a wonderful popularity, which has not yet altogether disappeared. The production gave great offense to the church as a body; the author was threatened with ecclesiastical censures, and in consequence resigned his living, and ever after acted and appeared as a layman. He retired into England, obtained the protection of the Earl of Bute, and received a considerable pension. His other plays, the *Siege of Aquileia,* the *Fatal Discovery, Alonzo,* and *Alfred,* are absolutely forgotten, a fate which their mediocrity deserves. His *History of the Rebellion of 1745-46* also disappointed public expectation.

Home Department, that department of the executive government of Britain in which the interior affairs of the country are regulated. It is analogous to the ministry of the interior of other countries; its headquarters is the home office, and its chief is the home secretary.

Homer (hō'mẽr; Greek, *Homēros*), an ancient Greek epic poet of whom nothing is known with certainty, some even doubting whether he ever existed. The most probable opinion is that he was a native of some locality on the sea-board of Asia Minor, and that he flourished between 950 and 850 B.C. The earliest mention of the name of Homer is found in Xenophanes (sixth century B. C.) The common statement that he was blind may safely be discarded. The poems that have been generally attributed to Homer are the *Iliad* and *Odyssey.* The *Batrachomyomachia,* or *Battle of the Frogs and Mice,* and certain hymns to the gods also passed under his name, though belonging to a later period. The *Iliad* in its present form consists of twenty-four books, and tells the story of the siege of Troy from the quarrel of Achilles with Agamemnon to the burial of Hector, with subordinate episodes. The *Odyssey* is also in twenty-four books, and records the adventures of Odysseus (Ulysses) on his return voyage to his home in Ithaca after the fall of Troy. Even as early as the beginning of the Christian era, certain Greek critics (the Separatists) maintained that the two poems were the work of different poets, but the general belief continued to be that there was one author for both. The entire system of Homeric criticism, however, was revolutionized in 1795 by F. A. Wolf in his *Prolegomena to Homer.* He asserted that the *Iliad* and *Odyssey* were not originally committed to writing, and were not two complete and independent poems, but originally a series of songs of different poets (Homer and others), celebrating single exploits of heroes, and first connected as wholes by Pisistratus, about 540 B.C. Some of Wolf's arguments have been proved erroneous, but since his time the old views in regard to the *Iliad* and *Odyssey* have been held by comparatively few of the ablest scholars, though what theory is now the most common is difficult to say. Among the most conservative theories is that which assigns to Homer a central or basal portion of both *Iliad* and *Odyssey,* to which additions by other poets were gradually united; but generally the *Odyssey* is regarded as of somewhat later date than the *Iliad,* and not by the poet who produced the *Iliad* in its original form.



Homer—ancient bust.

Homer, WINSLOW, painter, born at Boston, Massachusetts, in 1831. He studied lithography, then began to draw on wood for engravers, and in 1859 established himself in New York,

where he became a newspaper artist and correspondent. His war pictures were highly esteemed, especially his *Prisoners at the Front*. He died in 1910.

Home Rule, in British politics, a measure which has been very actively advocated in regard to Ireland. The leading feature of the Irish Home Rule party seems to be the establishment of a native parliament in Ireland to conduct all local and internal legislation, leaving the general political government of the empire to an imperial parliament. The movement originated in the formation of the Home Government Association at Dublin, in 1870, under the presidency of Mr. Isaac Butt. At the general election of 1874 the party succeeded in sending 60 Home Rule members to parliament for Irish constituencies. The elections of 1885 and 1886 still further strengthened the party, 86 members following the lead of Mr. Parnell (which see). The conversion of Mr. Gladstone and many members of the Liberal party to Home Rule principles added immense strength to the movement. In 1893 a Home Rule bill was passed by the Commons, but defeated by the Lords. Another bill introduced by Mr. Asquith in 1912 met with a similar fate; but was enacted into law May 25, 1914, over the veto of the House of Lords. It provides for an Irish Parliament consisting of a nominated House of Lords and a House of Commons with 164 members, a wide range of financial powers being granted to the Irish government. The outbreak of the European war (August, 1914) postponed enforcement, but Premier Lloyd George announced, in April, 1918, that the time had come to grant Home Rule, but coupled the announcement with the statement that conscription would be made applicable to Ireland. This led to opposition, and the measure was again postponed.

Home-sickness, in medicine, *Nostalgia*, a disease arising from an intense and uncontrolled feeling of grief at separation from one's home or native land.

Homestead (hōm'sted), a borough of Allegheny Co., Pa., 7 miles S. E. of Pittsburgh. Noted as a 'steel' town. Home of Carnegie Steel Works, principal plant of the U. S. Steel Corporation and other steel and iron works. A fatal strike occurred here in 1892. Pop. (1910) 18,713; (1920) 20,452.

Homestead Laws, laws enacted in the United States by Congress or by State legislatures with a view to securing to families the possession of a home and land. Under these laws any citizen, or person who declares an intention to become a citizen, male or female, 21 years old, may become the possessor of a homestead of 80 or 160 acres, by occupation and cultivation, to be taken from unreserved public lands. A fee of $5 or $10 is required to be paid on filing affidavit of settlement, citizenship, age, etc. The total fee is from $26 to $34, according to the district of settlement. Five years' residence and cultivation are required, but only three are demanded where 5 or 10 acres of forest trees have been cultivated. Ex-Union veterans or their heirs may obtain a patent one year after residence. Benefits are limited to one claim, except that veterans who have made one land settlement may also take a homestead claim. Under timber culture provisions homestead locators may secure another 160 acres, including timber area, by cultivating 40 acres of trees. A homestead is free from debt liability before patent issues and a locator may, on proof of settlement six months after occupancy, buy said land at preëmption price. A general land-office, forming a bureau of the Interior Department, is in charge of land administration. Each State has a surveyor-general, and each congressional district a land-office. The public lands are divided into 'hundreds,' 10 miles square; these into 'sections,' 1 mile square, and these into quarters of 160 acres and eighths of 80 acres.

Homicide (hom'i-sīd), the killing of one man or human being by another. In law, homicide is of three kinds—*justifiable*, *excusable*, and *felonious*—*justifiable*, when it proceeds from unavoidable necessity, as where the proper officer inflicts capital punishment, where an officer of justice kills an offender who assaults or resists him and who cannot otherwise be captured, or where persons are killed in the dispersion of rebellious or riotous assemblies; *excusable*, when it happens from misadventure, as where a man in doing a lawful act by accident kills another, or in self-defense, as where a man kills another in defense of the life of himself, his wife, children, parent, servant, etc.; *felonious*, when it proceeds from malice, or is done in the prosecution of some unlawful act, or in a sudden passion. Self-murder also is felonious homicide. Felonious homicide comprehends murder and manslaughter.

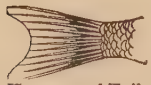
Homiletics (hom-i-let'iks), the art of preaching; that branch of practical theology which teaches the principles of adapting the discourses of the pulpit to the spiritual benefit of the hearers, and the best methods which

for instructing their hearers by their doctrines and example. Increased attention has been drawn to homiletics by Lyman Beecher of Yale.

Homily (hom'i-li), a discourse or sermon read or pronounced to an audience on some subject of religion; a discourse pronounced in the church by the minister to the congregation. The ancient homily was sometimes simply a conversation, the prelate talking to the people and interrogating them, and they in turn talking to and interrogating him. In modern use a homily differs but little from an ordinary sermon, the idea of simplicity, however, being always attached to it. The earliest existing examples of the homily are those of Origen in the third century. In the schools of Alexandria and Antioch this form of discourse was sedulously cultivated, and Clement of Alexandria, St. Dionysius, and Gregory Thaumaturgus are among the names most eminent in this department. It was in later centuries, however, and in the hands of Athanasius, Gregory of Nyssa, and Gregory of Nazianzus, Basil, Cyril of Jerusalem, and Cyril of Alexandria, and especially of Chrysostom that the homily reached its highest excellence. Augustine and Gregory the Great were among the western composers of homilies. In the Church of England, after the Reformation, two official books of homilies were issued. These were called *The First and Second Books of Homilies*, and the former, ascribed to Cranmer, appeared in 1537; the latter, said to be by Jewell, in 1563. They were originally meant to be read by those of the inferior clergy who were not qualified to compose discourses themselves.

Homing Pigeon. See *Carrier Pigeon.*

Homocercal (ho-mu-sėr'kal; Gr. *homos*, same, *kerkōs*, tail), a term applied in the case of fishes which have tails with rays diverging symmetrically from the backbone, as opposed to *heterocercal.*



Homocercal Tail.

Homœopathy (hō-mē-op'a-thi), the name of a system of medicine introduced by Samuel Hahnemann, of Leipzig (died 1843). It is founded upon the belief that drugs have the power of curing morbid conditions similar to those they have the power to excite, an old belief of Hippocrates long ago expressed in the Latin phrase *similia similibus curantur* ('like is cured by like'). In contradistinction to this system the more common method of treating diseases was termed by him *heteropathy* or *allopathy.* In practice homœopathy formerly was associated with the system of administering infinitesimal doses, though this practice has been modified within recent years and larger doses are given. The system of homœopathy in Europe, and especially in Britain, has been bitterly opposed by the older school of medicine, though the antagonism has mitigated within recent years. In the United States homœopathy met with less opposition and had a considerable development, numerous medical colleges, hospitals, etc., being established for the study and practice of this system. According to the definition adopted by the American Institute of Homœopathy, a homœopathic physician is one who adds to his knowledge of medicine a special knowledge of homœopathic therapeutics and observes the *law of similia.* All that pertains to the great field of medical learning is his, by tradition, by inheritance, by right. This explains why homœopathic physicians sometimes prescribe 'old school' drugs.

Homoiousians (hō-moi-ō'si-anz), a sect of Arians who maintained that the nature of Christ is not the same as but only similar to that of God. See *Homoousians.*

Homologous (hom-ol'o-gus), (1) in geometry, corresponding in relative position and proportion. (2) In physiology, corresponding in type of structure; thus, the human arm, the foreleg of a horse, the wing of a bird, and the swimming-paddle of a dolphin or whale, being all composed essentially of the same structural elements, are said to be homologous, though they are adapted for quite different functions. See *Analogue.*

Homoousians (hō-mō-ō'si-anz), the orthodox party in the church during the great controversy upon the nature of Christ in the fourth century, who maintained that the nature of the Father and the Son is the same, in opposition to the *Homoiousians*, who held that their natures were only similar.

Homoptera (hom-op'tėr-a), one of the sections into which the order of hemipterous insects has been

Homoptera—*Cicada Diardi.*

divided, the other section being the Heteroptera. The insects of this section have the wing-covers generally deflexed, of the

same consistence throughout, the antennæ mostly short and terminated by a bristle, and the body convex and thick. To this section belong the aphides, cicadas, lantern-flies, etc.

Homs (hōmz). See *Hems*.

Honan (hō'nän'), a once populous city of China, in the province of same name, on an affluent of the Hoang-ho. The province has an area of 65,104 square miles. It is generally level, and is watered by the Hoang-ho and its affluents. The soil is fertile and carefully cultivated; the forests in the west supply timber; and mines yield tutenag or Chinese copper, cinnabar, mica, etc. Honan suffered severely from the inundation of the Hoang-ho in 1887; capital, Kai-fung. Pop. about 22,000,000.

Honawar (hō-nä-wur'), seaport and chief town of subdivision of the same name, Bombay, on an estuary into which the Gersoppa river falls. It has an important and growing coasting trade. Pop. 6929.

Hondo (hon'dō), the name given by the Japanese to the chief island in their empire. In many geographical works Nippon or Niphon is the distinctive appellation of this island, but by the Japanese themselves that name is applied to the whole country. The area of the island is 87,425 sq. miles, and the population 33,327,935. See *Japan*.

Honduras (hon-dō'ras), a republic of Central America; area, 46,400 square miles, bounded N. by the Caribbean Sea and the Gulf of Honduras, W. by Guatemala, S. W. by Salvador and the Bay of Fonseca on the Pacific, and S. E. by Nicaragua, the coast line being about 350 miles in length. Its surface is hilly, with numerous fertile valleys. Its mineral wealth is very considerable, and includes gold, silver, lead and copper, the copper deposits being very rich. The chief rivers are the Chamelicon, Ulua, and Aguan, flowing to the Caribbean Sea, and the Choluteca, an affluent of the Pacific. There are extensive forests abounding in fine timber, including mahogany and rosewood, with dye-woods, copal, rubber, etc. The cultivated productions include maize, beans, some wheat, rice, plantains and tobacco. The banana is widely cultivated, sugar-cane yields two or three crops a year, the coffee is of excellent quality and sarsaparilla and vanilla of the best quality are grown. Since 1880 the capital has been Tegucigalpa; the principal ports are Truxillo on the Caribbean Sea, and Port San Lorenzo, on the Pacific. The constitution of Honduras gives the legislative power to a congress of deputies composed of thirty-seven members. The executive authority is in the hands of the President. Reciprocity of trade with the United States was established April 30, 1892. Pop. about 600,000.

Honduras, Bay of, a wide inlet of the Caribbean Sea, having on the south Guatemala and Honduras, and on the west British Honduras and Yucatan. Along its shores are the islands of Bonaca, Ruatan, Utila, Turneff, and numerous islets and reefs called cays.

Honduras, British, or Belize, a British colony of Central America, having north and west, Yucatan; west and south, Guatemala; and east, the Bay of Honduras. Area, 7,562 sq. miles. The coast is generally low and swampy, but the land rises towards the interior, and in some parts may be called mountainous. The mountains, and the wide valleys between them, are covered with extensive forests of the finest timber, including cedars, pines, ironwood, logwood, braziletto, mahogany, etc. Sugar-cane, coffee, bananas, cocoanut, tobacco, etc., are cultivated; and the exports include mahogany, logwood, bananas, and other fruits. The climate is fairly healthy. Since 1884 the government has been administered as in a crown colony under the presidency of a governor. The capital is Belize or Balize. Honduras was transferred by Spain to England by treaty in 1670, but at different times its occupation was contested by the Spaniards till 1783, since which period it has remained quietly in the possession of Great Britain. The population is composed chiefly of negroes and Caribs from the West Indies, who were first brought to the country as slaves. Pop. 31,471, including about 400 whites.

Hone (hōn), the name given to several varieties of slaty stones employed in whetting knives, razors, or other edge-tools. They are usually pieces of hard, close-grained clay-slate, containing minute particles of quartz, with a uniform consistence. Best of all varieties is the Turkey oil-stone, and next in esteem are the Arkansas oil-stones. Others of value are the German and Scotch hones, and the Canada oil-stones.

Hone, William, an English antiquary, born in 1780; died in 1842. He began life in a law-office, and became imbued with freethinking opinions. In 1800 he abandoned the law and made ventures as a writer, bookseller and publisher, which were all failures. In 1817 he was prosecuted by government for the publication of alleged irreverent

parodies and lampoons, when he defended himself with great acuteness, and was acquitted. He subsequently had a large sum subscribed for him as a champion of the freedom of the press. He gradually abandoned freethought and the writing of satires for religion and antiquarianism. His chief publications are the *Every-day Book* (1826), *Table-book* (1827-28), and *Year-book* (1829), perfect mines of antiquarian lore.

Honey (hun'i), a vegetable product with saccharine properties, collected by bees from the blossoms of flowers, and deposited in the cells of their combs. The best is clear and transparent, and solidifies when kept for some time into a granular, white mass. Some varieties of it are dark yellow or brownish in color. Spring honey is more esteemed than summer honey; and the latter more than that of autumn. *Virgin* honey is taken from hives in which the bees have never swarmed, and it is of a white color. *Yellow* honey is extracted from all sorts of combs. The flavor of honey largely depends on the plants from which it is collected. Honey is obtained in large quantities in many countries, partly from wild bees, but chiefly from those kept in hives. In addition to its ordinary domestic uses, it is employed medicinally as a promoter of expectoration, to sweeten certain medicines, to make a gargle with vinegar, etc. The ancients used it as we do sugar, and made of it and wine a mixture which they very much liked. They also used it in making mead, a fermented liquor made of honey and water. See *Honey-comb*.

Honey-ant, an ant (*Myrmecocyctus mexicanus*) inhabiting Mexico, and living in communities in subterranean galleries. In summer a certain number of these insects secrete a kind of honey in their abdomens which become so distended as to appear like small pellucid grapes. When food is scarce these ants feed the others from their store of honey. They are also dug up and eaten by the inhabitants of the country.

Honey-badger. See *Ratel*.

Honey Bear, a name of the kinkajou.

Honey-buzzard. See *Buzzard*.

Honey-comb, a waxen cellular structure framed by bees in which to deposit their honey and eggs. The wax is secreted by the insect in the form of small and thin oval scales in the folds of the abdomen. The comb is composed of a number of cells, most of them exactly hexagonal, and arranged in two layers placed end to end, the openings of the layers being in opposite directions. The comb is placed vertically, the cells being therefore horizontal. The sides of the cells are very thin, and yet the whole structure is of considerable strength. Some cells are destined for the exclusive reception of honey; others for the reception of larvæ.

Honey-dew, a liquid saccharine substance found on the leaves of trees and other plants in small drops like dew. There are two kinds; one secreted from the plants, and the other deposited by aphides. Different kinds of manna are the dried honey-dew or saccharine exudations of certain plants. See *Manna*.

Honey-eater, the name given to a number of insessorial birds forming the family of Meliphagidæ, of the tribe Tenuirostres. They form a

Wattled Honey-eater (*Anthochæra mellivŏra*).

numerous group, feeding principally on honey and the nectar of flowers. They are natives of Australia and the adjacent islands. They have long curved sharp bills, with tongues terminating in a pencil of delicate filaments, to enable them the better to extract the juices of flowers.

Honey-guide, a name given to the cuckoos of the genus *Indicator*, which by their motions and cries conduct persons to the nests of wild honey-bees. They are natives of South Africa.

Honey-locust, Sweet Locust, or Black Locust (*Gleditschia triacanthos*), a forest tree belonging to the United States, natural order Leguminosæ. The leaves are pinnated, divided into numerous small leaflets, and the foliage has a light and elegant appearance; the flowers are greenish, and are succeeded by long, often twisted pods, containing large brown

seeds, enveloped in a sweet pulp. This tree is especially remarkable for its formidable thorns, on which account it has been recommended for hedges. The *G. monosperma*, a tree resembling the last in general appearance, grows in swamps in Illinois and southwestward. The wood is inferior in quality.

Honey-stone. See *Mellite.*

Honey-suckers. Same as *Honey-eaters.*

Honeysuckle, or WOODBINE, genus *Lonicĕra* of Linnæus, natural order Caprifoliaceæ. *L. periclymĕnum*, a twining shrub, with distinct leaves and red berries, is indigenous in Great Britain; but two others have been naturalized, *L. caprifolium*, distinguished by its upper leaves being united in a cup; and *L. xylosteum*, with small, yellowish, scentless flowers, and scarlet berries. *L. sempervirens* (trumpet-honeysuckle) is also cultivated in Britain on account of the beauty of its flowers. The honeysuckle family is represented in North America by nine different species. *Australian honeysuckle* is a name given to *Banksia australis* and other species of the Protea family, from their flowers being filled with a sweet liquid.

Honfleur (on-fleur), a seaport of France, department of Calvados, on the estuary of the Seine. It was a poorly-built place, but has lately been much improved. The rise of Havre has injured its commerce, but it still has a trade in agricultural and dairy produce, some manufactures in connection with shipping, fisheries, etc. On the hill above the town is the chapel of Nôtre Dame de Grace, much frequented by sailors, and filled with their votive offerings. Honfleur was long in possession of the English, and makes a considerable figure in the history of their French wars. Pop. 8853.

Hong-Kong (h o n g - k o n g'), an island and off the S. E. coast of China, belonging to the British, at the mouth of the estuary that leads to Canton, from which it is distant 90 miles. It is about 10 miles in extreme length, and 7½ miles in extreme breadth, separated from the mainland by a narrow strait, and with Cowloon on the mainland forms a crown colony, area 32 sq. miles. The island consists almost entirely of barren rocks, which rise to heights of 1000 to 2000 feet, and is almost destitute of vegetation. Good water, however, is abundant. On the north side of the island, on a splendid harbor, is Victoria, the chief town of the island and center of its commerce. It is well laid out with handsome streets, and has a cathedral, a bishop's palace, a government house, courthouse, etc., while handsome residences of the merchants are scattered about the town and its suburbs. Hong-Kong is a great entrepôt for the foreign commerce of China, and is a free port without customs' dues. It is also a station of the British fleet. The revenue of the government is derived from the land rents, licenses to sell opium, spirits, etc., taxes, postages, fines, fees of office, etc. The prosperity of the colony is chiefly owing to the presence of large numbers of Chinese, engaged in trade or in working the building-stone, which is one of the principal products of the island. The foreign commerce is mainly carried on with Great Britain. The currency consists chiefly in dollars coined in England, value about 4*s.* 2*d.* each. Hong-Kong was ceded to Britain by the Treaty of Nan-King in 1842. The population in 1912 was 456,739, of which number over 400,000 were Chinese.

Honiton (hon'i-tun), a town of England, in Devonshire, on the Otter, long celebrated for the manufacture of a special variety of lace. Pop. 3271.

Honolulu (hō-nō-lō'lō), a city, the capital and principal port of the Hawaiian Islands, on the south side of the Island of Oahu. The city is well laid out, with fine public squares, clean streets, and tropical gardens, the climate being pleasant and healthful. It contains extensive and handsome government buildings, the palace of the former kings, museum, theater, library, churches, etc., and has street railways and electric lights. Newspapers and magazines are published in the Hawaiian, Japanese, Chinese, and several European languages. At the wharves are landing facilities for the largest vessels, and there are steamship lines to various American and foreign ports. There are foundries, shipyards, and manufacturers of iron, carriages, ice, etc. Pop. (1914) 60,000.

Honorius (ho-no'ri-us), FLAVIUS, son of Theodosius the Great, born 384 A.D.; died 423. After the division of the empire, A.D. 395, Honorius received the western half, but, on account of his youth, Stilicho was appointed his guardian. The principal events of his reign are the adoption of rigorous measures against paganism in 399; the invasion by Alaric in 400-403; another irruption of barbarians under Rhadagaisus, 405-406. Both invasions were repelled by Stilicho, who was assassinated at Ravenna in 408. Alaric marched on Rome and plundered it in

409, while Honorius shut himself up in Ravenna. Some of the finest provinces of the empire, Spain, Gaul, and Pannonia, were lost in this reign.

Honor (on'ur), in law, is a seignory consisting of several manors held under one baron or lord-paramount.

Honor, MAIDS OF, ladies in the service of an European queen who attend their mistress when she appears in public. In England they are eight in number.

Honorable (on'ur-a-bl), RIGHT HONORABLE and MOST HONORABLE, titles given in the United Kingdom to peers, their families, and certain public functionaries. (See *Address, Forms of.*) In America the governors of States, judges, members of Congress, and others holding offices of dignity and trust, are styled honorable.

Honors of War, are stipulated terms granted to a garrison surrendering, in consideration of a brave defence, etc. Sometimes the vanquished are allowed to march out with their arms, drums beating and colors flying; or they may be permitted to deposit their arms and stores and return to their own country on parole.

Hoobly (hö'bli), or HUBLI, a town of India in Dhárwár district, Bombay Presidency, a great center of the cotton trade. Pop. 60,214.

Hooch, or HOOGH (hōh), PIETER DE, one of the best Dutch painters in genre, born in 1630; died about 1681. He was peculiarly successful in depicting scenes, illuminated by sunlight, of Dutch domestic life.

Hood, JOHN BELL, general, born in Bath Co., Kentucky, in 1831; died in 1879. He graduated at West Point in 1853, joined the Confederate army in the Civil war, commanded a division of Lee's army at Antietam and at Gettysburg, and lost a leg at Chickamauga. Commissioned lieutenant-general, he succeeded Johnston in command of the army opposing Sherman in 1864. He was defeated by Sherman in two battles, was forced to abandon Atlanta, and afterwards invaded Tennessee.

Hood, MOUNT, is the northernmost peak in Oregon in the Cascade Range, and can be clearly seen from Portland. The glaciers, such as the Elliot, the crevasses, and moraines of Mt. Hood have yet to be explored. It has a height of 11,225 ft. See *Cascade Range.*

Hood, ROBIN, a celebrated outlaw who, according to the popular account, with his followers, inhabited Sherwood Forest, in Nottinghamshire, and also the woodlands of Barnsdale in the adjoining West Riding. They supported themselves by levying toll on the wealthy, and more especially on ecclesiastics, and by hunting the deer of the forest. The famous members of his band were his lieutenant, Little John; his chaplain, Friar Tuck: William Scadlock, George-a-Greene, Much, the miller's son, and Maid Marian. It is stated that he was born in 1160. His death is said to have occurred in 1247, in consequence of the treachery of the prioress of Kirklees, who opened an artery by which he bled to death. His skill with the long-bow and quarter-staff was celebrated in tradition. What basis of fact there is for the story of Robin Hood is doubtful. Grimm maintained that he was one with the Teutonic god Woden. Other theories suppose him to have been a rebel yeoman in Lancaster's rebellion under Edward II; a Saxon chief who defied the Normans; and a fugitive follower of Sir Simon de Montfort after the battle of Evesham.

Hood, SAMUEL, VISCOUNT, a British admiral, born 1724; died 1816. He joined the navy as a midshipman in 1740, and attained the rank of post-captain in 1759. Having become rear-admiral, he preserved the island of St. Christopher's from being taken by De Grasse, assisted in the defeat of De Grasse by Rodney in 1782, and was rewarded with the title of Baron Hood of Catherington in the Irish peerage. In 1793 he commanded against the French in the Mediterranean, and captured Toulon and Corsica. In 1796 he was made an English peer, with the title of Viscount Hood.—ALEXANDER, VISCOUNT BRIDPORT, brother of the preceding, was also an admiral. He commanded under Lord Howe in the Channel fleet in 1794;

Viscount Hood.

defeated the French off L'Orient, 1795; was created Viscount Bridport, 1801; died 1814.—Sir Samuel, cousin of the above, born 1762; died 1815, was present at the battle of the Nile, 1798; captured Tobago and the Dutch settlements in Guiana, 1803; and defeated the French squadron off Rochefort in 1806.

Hood, Thomas, an English poet and humorist, of Scotch extraction, born at London in 1798; died in 1845. During a residence at Dundee, and while only fifteen or sixteen years of age, he contributed articles to a local paper and magazine. In 1821 he became subeditor of the *London Magazine*, and in 1826 appeared his *Whims and Oddities*, which was followed by *National Tales* and a volume of serious poetry. From 1829 to 1837 he conducted a *Comic Annual*. At the same time his pen was employed on other subjects, and he published *The Epping Hunt*, a comic poem, ridiculing Cockney sportsmen; *Eugene Aram's Dream*, inserted in the *Gem*, of which he was for a short time editor; and *Tylney Hall*, a novel. In 1837, on the termination of the *Comic Annual*, he commenced a monthly periodical entitled *Hood's Own*, which consisted chiefly of selections from the former work. His health now began to fail, and with a view to its recovery he paid a visit to the Continent. While there in 1839 he published his *Up the Rhine*, which, based on the lines of Humphrey Clinker, was very popular. Shortly after his return he undertook the editorship of the *New Monthly Magazine*, and continued it till 1843. His principal contributions to it he published separately, under the title of *Whimsicalities*. His last periodical, entitled *Hood's Magazine*, was commenced in 1844; but his health shortly afterwards completely broke down, and his death occurred in the following year. It was during his last illness that he contributed to *Punch*, *The Song of a Shirt*, *The Bridge of Sighs*, and *The Lay of a Laborer*. Hood is unrivaled as a punster, and he possesses a singular power of combining the humorous with the pathetic. He had the satisfaction of knowing that the pension of £100 conferred upon him during his last illness by Sir Robert Peel was to be transferred to his wife.

Hood, Tom, son of the great humorist, and a miscellaneous writer, born in 1835; died in 1874. He studied at Oxford, and during his residence there he wrote *Pen and Pencil Pictures*. In 1861 appeared his *Daughters of King Daker, and other Poems*. In 1865 he became editor of *Fun*, which became very popular under his management. His talents, although similar to those of his father, were less brilliant.

Hooded Crow. See *Crow*.

Hooded Seal (*Cystophŏra cristāta*), a species of seal, the male of which possesses a movable inflatable muscular bag, stretching from the muzzle to about five inches behind the eyes. The prevailing color is bluish black—the head and limbs being uniformly black. Its usual range extends in America southwards to Newfoundland, and in Europe to Southern Norway.

Hooded Snake. See *Cobra de Capello*.

Hoofs, the horny tissues which constitute the external part of the feet of certain animals, mostly herbivorous. They may be regarded as homologues of the toe-nails of other animals. They are composed of epithelium cells, agglutinated and dried, and of intercellular substance and cell contents. Chemically they consist of keratin.

Hooghly River. See *Hugli*.

Hook, Theodore Edward, novelist and journalist, born at London in 1788; died in 1841; was the son of James Hook, a musical composer. After leaving Harrow he employed himself in composing the farce of *The Soldier's Return*, instead of reading for Oxford. For some years Hook led a life of gaiety in London, and became notorious for practical jokes and similar escapades. In 1812 he was appointed accountant-general and treasurer of the Island of Mauritius; but, owing to his gross carelessness, a large deficiency in the military chest was discovered, and in 1818 he was sent home under arrest, but no proceedings were taken against him. From 1820 to 1841 he was editor of the *John Bull*, and at intervals from 1824 to 1828 he published his *Sayings and Doings*, while in 1836 he became editor of the *New Monthly Magazine*. His other principal works are *Life of Sir David Baird*, and a series of novels, among which may be mentioned *Love and Pride*, *Jack Brag*, *Gilbert Gurney*, *Gurney Married*, *Precepts and Practice*, and *Fathers and Sons*.

Hook, Walter Farquhar, Dean of Chichester, born at London in 1798; died in 1875. In 1821 he graduated at Christ Church, Oxford, was appointed vicar of Leeds in 1837, and promoted to the deanery of Chichester in 1859. He wrote an *Ecclesiastical Biography*, a *Church Dictionary*, *Lives of the Archbishops of Canterbury*, etc.

Hookah. See *Pipe* (*Tobacco*).

Hooke, NATHANIEL, an English historian, born about 1690; died 1763. He was a friend of Pope and other literary men. His best-known work is his *Roman History, from the Earliest Period to the Accession of Augustus.*

Hooke, ROBERT, an English mathematician and natural philosopher, born 1635; died 1703. In 1658-59 he invented the balance spring of watches, an honor otherwise ascribed to Huyghens. He partially anticipated the Newtonian theory of gravitation and the undulatory theory of light.

Hooker (hụk'ẽr), JOSEPH, general, was born at Hadley, Massachusetts, in 1815. Graduating at West Point in 1837, he served in the Florida and Mexican wars with conspicuous gallantry. At the outbreak of the Civil war he was made brigadier-general of volunteers. He distinguished himself in the several engagements in the Peninsula in 1864, particularly at Malvern Hill, and became known as 'fighting Joe Hooker.' He took part in the subsequent battles of 1862, being wounded at Antietam, and subsequently was commissioned brigadier-general in the regular army, already holding the rank of major-general of volunteers. He commanded a division at Fredericksburg, was given command of the army of the Potomac in January, 1863, and was defeated by Lee and Jackson at Chancellorsville in May. He took part in the battles near Chattanooga, and in the battle of Lookout Mountain he was commander. Later he commanded the army of the Cumberland near Atlanta, Georgia. In 1864 he had charge of the northern department, of the department of the east in 1865, and in 1866 that of the lakes. He died in Garden City, Long Island, in 1879.

Hooker, SIR JOSEPH DALTON, a British botanist, born in 1817, son of Sir W. J. Hooker. In 1839 he joined the antarctic expedition of the *Erebus* and *Terror* under Sir J. C. Ross, publishing on his return the *Botany of the Antarctic Voyage.* In 1847-51 he traveled in the Himalayas, and his *Himalayan Journals* embody the results of the journey. He and George Bentham (which see) wrote the great work *Genera Plantarum*, published 1862-1883.

Hooker, RICHARD, a celebrated English divine, born in 1553; died in 1600. In 1579 he was appointed deputy professor of Hebrew; took orders in 1581, and was made preacher at Paul's Cross. His *Ecclesiastical Polity*, published at various dates, and written in defense of the Church of England, is remarkable for learning and style.

Hooker, THOMAS, an English-American theologian, born in Markfield, Leicestershire, England, in 1586; died in Hartford, Conn., in 1647. He settled in Newtowne (now Cambridge), Mass., in 1633, but being discontented with conditions led his congregation to Connecticut and founded Hartford in 1636. He caused the adoption of the *Fundamental Orders of Connecticut*, and in 1643 was one of the organizers of the United Colonies of New England. He published a number of sermons and various theological treatises.

Hookworm, a small, worm-like animal, the cause of a serious parasitic disease. The disease was first traced to this worm (a minute form, less than an inch in length) in Italy in 1843. Its action in exhausting the blood was not discovered until 1879, and not until 1902 was the existence of an American variety of the animal demonstrated by Dr. Charles W. Stiles, of the Marine Hospital Service, who indicated the character of the disease by calling it the 'germ of laziness.' The poorer classes of the South had long manifested a peculiar lassitude, with anæmic pallor. Dr. Stiles traced the worm into the body from the soil, finding that it made its way through the skin of the feet into the circulation, reaching the lungs and from them the respiratory passages and the digestive tract. Fastening itself to the walls of the bowels, it sucks the blood of the victim. There may be several thousand of these worms in one person, causing considerable loss of blood by sucking and by making minute holes through which the blood oozes into the intestinal tract. It is believed that the hookworm was conveyed to America from Africa by negroes brought in slave ships. It does not seriously affect the negroes, but has been affecting the whites for more than a century, producing a condition unfitting them for energetic labor. Dr. H. F. Harris was the first to recognize the eggs of the hookworm and realize the danger of the disease in this country. In 1902 Dr. Stiles was sent a bottle of the parasites from the South, and found in it a different species from that of Europe. Out of 130 cotton mill operatives he found more than 12 per cent. with the disease. In the sandy districts more than 70 per cent. were infected, and in some localities as many as 90 per cent. The disease is confined in this country to the South, rarely appearing north of the Potomac. Its wide prevalence is attributed to the unsanitary habit of blacks and poor whites alike in distrib-

uting their excrement over the soil and in going barefoot, giving the worms in the excrement an opportunity to fasten in the skin of the feet. Fortunately the disease is easily cured by the use of thymol, which kills the worms or forces them to loosen their hold, followed by purgatives, which removes them from the body. By the adoption of suitable sanitary habits this serious affection may be eradicated. John D. Rockefeller, in 1909, contributed $1,000,000 to be used in fighting the disease, and now that its cause and the method of dealing with it are so well known its ravages may be overcome.

Hoole (höl), JOHN, dramatist and translator, born at London in 1727; died in 1803. In 1763 he published a translation of Tasso's *Jerusalem Delivered*, and of six dramas of Metastasio in 1767. His tragedies of *Cyrus*, *Timanthes* and *Cleone* were unsuccessful. In 1773-83 he published separate volumes of his translation of *Orlando Furioso*. In 1792 he translated Tasso's *Rinaldo*, and ended his literary labors with a more complete collection of dramas from Metastasio.

Hoop-ash (*Celtis crassifolia*), an American tree of the order Urticaceæ, found in the forests of Ohio and in the western States. It is a fine tree, attains a height of 80 feet, and is employed for charcoal. Its fruit is round, and in size nearly equal to a pea. See *Hackberry* and *Nettle-tree*.

Hooper (hup'ẽr), JOHN, an English reformer, born in 1495. Having studied at Oxford, he joined the Cistercian order, but by the year 1539 he had adopted the Reformed opinions, and withdrew to the continent on the imposition of new articles of faith by Henry VIII, and lived at Zurich. In 1547 he returned to England, and took an active share in the Edwardine Reformation. In 1550 he was nominated Bishop of Gloucester, but declined consecration until certain vestments and ceremonies were dispensed with in his case. On the accession of Queen Mary, in 1553, Hooper was deprived and imprisoned, and in 1555, was burned at Gloucester.

Hoopeston (hoop'stun), a city of Vermilion Co., Illinois, 99 miles S. of Chicago. It is the seat of Greer College. It has manufactures of gas engines, chemicals, machinery, etc., and is noted for its sweet-corn canneries. Pop. (1920) 5451.

Hooping-cough, or WHOOPING-COUGH, a disease known by a rapid series of coughs ending in a long-drawn inspiration, during which a shrill whistling sound, the *hoop*, is produced. Two or three such fits of coughing follow one another, until some phlegm is expelled, and vomiting may occur. During a severe spasm the face becomes swollen and purplish, as if suffocation were threatened. It is evidently due to a poison acting as an irritant on the pneumogastric nerve. It is contagious, and most commonly attacks children, and generally only once in their lives. The hooping-cough usually comes on with a running nose, difficulty of breathing, and slight fever, which are succeeded by a hoarseness, cough and difficulty of expectoration.

Hoopoe (hu'pö; *Upŭpa*), a bird forming the type of a family generally classed with the bee-eaters or the honey-eaters, but also with the horn-

Hoopoe (*Upŭpa epops*).

bills. The European hoopoe (*U. epops*) is about 12 inches long; it has a fine crest of pale cinnamon-red feathers, tipped with black; upper surface on the whole ashy-brown; wings black, the coverts having white bars; throat and breast pale fawn; abdomen white, with black streaks and dashes. It has a very wide range, from Burmah to the British Islands and Africa. It is a ground-feeder, preying chiefly on insects, and seems to delight in filth; it nests in cavities of trees or walls, and its eggs vary from four to seven. The hoopoe utters a loud double or treble *hoop*, whence its name.

Hoorn (hörn), a seaport of Holland, on a small bay of the Zuider-Zee, 20 miles N. N. E. of Amsterdam. The trade is extensive, more especially in cheese. Pop. 10,647.

Hoosac Tunnel, a railway tunnel in the western part of Massachusetts, on the railway

from Boston to Troy, N. Y It pierces the Hoosac Mountain, the summit range extending southward through Massachusetts from the Green Mountains of Vermont. It is 4¾ miles long, and has a double line of rails.

Hoosick Falls, a village of Rensselaer county, New York, 25 miles N. E. of Troy. It has manufactures of reapers, mowers, woolen goods, iron and paper mill machinery. Pop. 5532.

Hoover, HERBERT C., mining engineer and government officer, was born at West Branch, Iowa, in 1874. He engaged in mining operations in California, Australia, and China, where in 1899 he became chief engineer of the Chinese Imperial Board of Mining. Going to England he was occupied with mining and other enterprises and on the outbreak of the European war was made chairman of the American Relief Commission in London and later of the American Commission for Belgian Relief. On the United States entering the war he returned to accept the office of Food Controller. In 1921 he was appointed secretary of commerce in the cabinet of President Harding.

Hop (*Humŭlus lupŭlus*), a plant of the nat. order Cannabinaceæ (hemp family), a native of Europe, and perhaps of the United States, where it occurs wild. The root is perennial, giving out several herbaceous, rough, twining stems, with large lobed leaves; the fertile flowers are green; the fruit is a catkin, and the plant is cultivated for the sake of the catkins, which are employed to communicate to beer its bitter flavor. The young shoots are sometimes boiled and eaten like asparagus; the fibers of the old stems make good cords. The cultivation of the hop is more carefully attended to in England than in any other country, Kent being the chief county in which it is grown, but the plant is also extensively reared in other parts of Europe, as also in North America, Australia, New Zealand, etc. The use of the hop catkins depends upon a peculiar bitter substance which they contain, called *lupulin*, which is a yellow powder, containing a bitter principle and a volatile oil. The lupulin constitutes from 10 to 12 per cent by weight of the catkin, and the bitter principle forms 8 to 12 per cent of the lupulin. Having tonic, stomachic and narcotic properties, hops are often used medicinally. Pillows stuffed with hops are used to induce sleep.

Hop-Clover (*Trifolium procumbens*), a plant of the order Leguminosæ, distinguished from other species of clover by its yellow flowers.

Hope (hōp), ANTHONY. See *Hawkins.*

Hop-flea (*Phyllotreta concinna*), a coleopterous insect of the same genus with the turnip-fly, and which devastates hop plantations. It feeds upon the young shoots.

Hopi (hō'pi), or MOKI, a tribe of N. American Indians of Shoshonean stock; first mentioned in the account of the expedition of Coronado (1540). They were then town-building Indians of Arizona. They fought unsuccessfully against the Spaniards in 1540, 1542 and 1586, but were victorious in 1680. There are still about 2000 of them in N. E. Arizona. They build houses of stone, and are engaged in 'dry-farming,' wood-carving, basket-making, and pottery. Among their elaborate ceremonies is the famous 'snake dance,' with live rattlesnakes in the mouth.

Hopkins, JOHNS, philanthropist, born in Anne Arundel county, Maryland, in 1795. Died in 1873. He gave property worth over $7,000,000 to found a free hospital and Johns Hopkins University in Baltimore.

Hopkins, SAMUEL, American theologian, was born at Waterbury, Conn., 1721; died 1803; was noted particularly as the founder of 'Hopkinsian divinity,' a modification of Calvinism, and a fuller development of the theology of Jonathan Edwards, which he expounded in his *System of Doctrines* (1793). Hopkins was one of the ablest of American theologians and was probably the first of the Congregational ministers to oppose slavery.

Hopkins, STEPHEN, statesman, born in Providence, Rhode Island, in 1707; died in 1785. He became chief justice of the Superior Court of Rhode Island in 1751, and was elected governor in 1756. He was a member of the Continental Congress and a signer of the Declaration of Independence.

Hopkinson (hop'kin-sun), FRANCIS, a signer of the Declaration of Independence, was born in Philadelphia in 1737. He was admitted to the bar in 1761. In 1776 he was a delegate to the Continental Congress. During the war for independence his patriotic writings powerfully influenced public sentiment. His humorous *Battle of the Kegs* still holds a place in literature. He died in 1791.

Hopkinsville, county seat of Christian county, Kentucky, 73 miles N. of Nashville; has an extensive trade in tobacco, and various manu-

factories, flour mills, etc. Here are McLean College and Bethel Female College. Pop. 9696.

Hoquiam (hō'kwi-am), a city of Grays Harbor Co., Washington, on Grays Harbor at mouth of Hoquiam River. It has a fine harbor and is surrounded by a great area of timberlands. It is the greatest initial shipping point for lumber products in the United States. Other industries are fresh and canned fish, clams, crabs, and other sea food; whaling, dairying and berry growing. Pop. (1920) 9885; precinct, 10,163.

Horæ (hō'rē), in classical mythology, the goddesses of the seasons and the order of nature. Their number was indefinite; in Athens two only were worshiped. They are represented as blooming maidens carrying the different products of the seasons.

Horapollo (ho-rā-pol'o), the alleged author of a work in Egyptian hieroglyphics pretended to have been translated from the Egyptian into Greek. By many authorities the book is supposed to have been written about the fifth century and translated as late as the fifteenth.

Horatii (ho-rā'she-ī), three Roman brothers, who, according to tradition, in the reign of Tullus Hostilius engaged three Alban brothers (the Curiatii), in order to decide the supremacy between Rome and Alba. Victory went to Rome, and the sole surviving Horatius was triumphantly conducted back to the city. But his sister had been betrothed to one of the Curiatii, and her demonstrative grief so enraged Horatius that he stabbed her. For this he was condemned to death, but his father and the people obtained his pardon.

Horatius Cocles (ho-ra'she-us ko'klēz), a hero of ancient Rome. The Tarquins having, after their banishment, sought refuge with the Etrurian king Porsenna, the latter advanced against Rome (B.C. 507) to restore them. According to tradition Horatius Cocles, along with two companions, held the Sublician bridge against the enemy, while the Romans broke it down behind them. When this was nearly finished he sent back his two companions, and as the bridge fell he plunged into the Tiber with his armor and safely reached the opposite bank.

Horatius Flaccus, QUINTUS, commonly known as HORACE, the greatest of Latin lyric poets, was born near Venusia, in Southern Italy, B.C. 65. His father was a freedman, a collector of taxes, and had purchased the farm at which his son was born. When Horace was about twelve years of age his father removed with him to Rome, where he received an excellent education. At the age of eighteen he went to Athens to complete his studies. After the assassination of Julius Cæsar Brutus came to Athens, and Horace, along with other Romans youths, joined the army. He was appointed to a military tribuneship, was present at Philippi, and on the defeat of Brutus saved himself by flight. On the proclamation of an amnesty to the vanquished Horace returned to Italy, but found his father dead, his paternal estate confiscated, and himself reduced to poverty. He was, however, enabled to purchase a clerkship in the quæstor's office, which enabled him to subsist frugally and to cultivate his poetical talent. His poems procured him the friendship of Virgil and Varius, and to them he was indebted for his first acquaintance with Mæcenas, who was the friend and confident of Augustus Cæsar, and who expended his wealth for the encouragement of literature and the arts. Mæcenas received Horace among his intimate friends, and, after some years, presented him with a small estate or farm in the Sabine country about 15 miles from Tibur (Tivoli), which was sufficient to maintain him in ease and comfort during the rest of his life. He had also a cottage at Tibur, and at Rome or one or other of these country residences the latter part of his life was spent. Although he was ultimately introduced to Augustus he never sought favors from him, and he is said to have declined an offer of the management of his private correspondence. He died in B.C. 8, the same year as his friend and patron Mæcenas. His works consist of four books of odes; a book of epodes or short poems, two books of satires; and two books of epistles, one of which is often cited as a separate work, under the title of *Ars Poetica*. The lyrics of Horace are largely based on Greek models, but the exquisite beauty of his language is all his own. It is, however, in his satires and epistles that he shows the greatest power and originality, wit and humor, gravity and gaiety, shrewdness and common sense, tender sentiment, and at times melancholy. His writings have been often translated, and into many languages. In English Pope and Swift have given free imitations of various parts of his writings. The poetical translation of Francis is well known, but is inferior to that of Sir Theodore Martin.

Hörde (heur'dē), a town of the Prussian province of Westphalia on the Emscher, center of the iron manufac-

ture, and having large coal-mines. Pop. (1910) 32,791.

Horde'olum See *Stye.*

Hor'deum See *Barley.*

Horeb (hō'reb; Arabic, *Jebel Mûsa,* Mountain of Moses), a mountain belonging to the same ridge as Mount Sinai, where is still pointed out the rock from which water issued at the blow of Moses.

Horehound (hōr-hound; *Marrubium vulgāre*), a labiate plant, with whitish, downy leaves and stem; flowers, small, nearly white, in crowded whorls, possessing an aromatic smell and bitter flavor. It is a popular remedy for coughs and colds, usually as an infusion. It is a native of Europe. Black horehound (*Ballōta nigra*), also a labiate plant, is a malodorous and unattractive weed. Horehound is domesticated in the United States.

Horehound (*M. vulgāre*).

Horgen (hōr'gen), a town of Switzerland, on the lake of Zürich, with some manufactures and a harbor with a considerable trade. Pop. 6914.

Horizon (ho-rī'zon), in ordinary speech the line where earth and sky seem to meet, or the circle which bounds that part of the earth's surface visible to a spectator from a given point. This is termed the *sensible, visible* or *apparent horizon,* as distinguished from the *rational* or *celestial horizon,* an imaginary great circle, parallel to the sensible horizon, whose plane passes through the earth's center, whose poles are the zenith and the nadir, and which divides the sphere into two equal hemispheres. In observations with the sextant at sea, when the real horizon is invisible a small basin containing mercury may serve as an *artificial horizon.* The observation that is then made is the angle between the sun or star and the image of the sun or star in the basin of mercury, and it is easily seen that half this angle is the altitude of the object above the real horizon. In geology, the term is applied to any well-marked formation which suffices as a starting-point from which to study the rest.

Horizon, Dip of. See *Dip.*

Horizontal Parallax. See *Parallax.*

Horn (hōrn), a general term applied to all hard and pointed appendages of the head, as in deer, cattle, etc., but as a term denoting a particular kind of substance nothing should be called horn which is not derived from the epidermis or outer layer of the integument, whether on the trunk, hoofs, or head. Horn is a tough, flexible, semitransparent substance, most liberally developed in the horns of bovine animals, but also found in connection with the 'shell' of the tortoise, the nails, claws and hoofs of animals, the beaks of bird and turtle, etc. Horn is softened very completely by heat, so as to become readily flexible, and to adhere to other pieces similarly softened. True horn consists principally of an albuminoid principle, *keratin,* with a small portion of gelatine and a little phosphate of lime. In some species of animals the males only have horns, as for instance the stag. In cattle both male and female have horns, though there are also hornless cattle. Horns differ widely in the case of different animals. Thus the horns of deer consist of bone, and are deciduous; those of the giraffe are independent bones, with a covering of hairy skin; those of oxen, sheep, and antelopes consist of a bony core covered by a horny sheath. The horns of the rhinoceros alone consist exclusively of horny matter. The horns of oxen, sheep, goats and antelopes are never shed, except in the case of the prong-horned antelope. The number never normally exceeds four, and in the case of deer the horns are branched.

The various kinds of horns are employed for many purposes. The principal used in the arts are those of the ox, buffalo, sheep and goat. Deer horns are almost exclusively employed for the handles of knives and of sticks and umbrellas. Those which furnish true horn can be softened by heat (usually in boiling water), cut into sheets of various thickness, which sheets may be soldered or welded together at the edges so as to form plates of large dimensions, and polished and dyed so as to imitate the much more expensive tortoise shell. The clippings of horn may be welded together in the same manner, and made into snuff-boxes, powder horns, handles for umbrellas, knives, forks, etc. As horn has the valuable property of taking on and retaining a sharp impression from a die, many highly ornamental articles may be turned out. Combs for the hair are made from the flattened sheets, and out of the solid parts of buffalo horns beautiful carvings are made.

Horn, a musical instrument, originally formed, as the name de-

notes, from the horn of an animal. The name includes a large family of wind-instruments, many of which have fallen into disuse. The French horn, or simply *the horn*, consists of a metallic tube of about 10 feet in length, very narrow at top, bent into rings, and gradually widening towards the end whence the sound issues, called the *bell*. It is blown through a cup-shaped mouthpiece of brass or silver, and the sounds are regulated by the player's lips, the pressure of his breath, and by the insertion of the hand in the bell of the instrument. As a simple tube, unprovided with holes, the horn yields only the generating note, and of course would be confined to one key; but by means of *crooks* the tube can be lengthened, and transposed into any key. By inserting the hand into the bell, which flattens a note, the intermediate notes are produced. The compass of the instrument is three octaves. Music for the horn is always written in the key of C, an octave higher than it is played, with the key of the composition marked at the beginning of each movement: thus 'corni (or horns) in D' directs the performer which crook he must use to play the notes in the key indicated. The bugle, cornet-a-piston and saxhorn are allied instruments.

Horn, CAPE. See *Cape Horn.*

Horn, HOORNE, or HORNES, PHILIP, COUNT VAN, a Flemish soldier and statesman, born 1518. He was the son of Joseph de Montmorency-Nivelle, and of Anne of Egmont, and stepson of John, count van Horn, who constituted him and his brother his heirs on the condition of assuming his name. Philip gradually rose to be governor of Gueldres and Zütphen, admiral of the fleet, and councilor of state. He fought at St. Quentin in 1557, and at Gravelines in 1558, and in 1559 accompanied Philip to Spain. On his return he joined the Prince of Orange and Egmont in resistance to Philip. On the arrival of Alva at Brussels he was arrested in September, 1567, on a charge of high treason, and he and Egmont were beheaded in June, 1568.

Hornbeam (hōrn'bēm; *Carpinus Betŭlus*, nat. order Cupuliferæ), a small bushy tree common in Britain, and often used in hedges, as it stands cutting and in age becomes very stiff. The wood is white, tough, and hard, and is used in turnery, for cogs of wheels, etc. The inner bark yields a yellow dye. The American hornbeam (*Carpinus americāna*) is a small tree sparingly diffused over the whole of the United States. The wood is fine grained, tenacious, and very compact.

Hornbills (hōrn'bilz), a remarkable group of birds (*Buceroti-dæ*), confined to Southern Asia and Africa, akin to the kingfishers and the toucans, remarkable for the very large size of the bill, and for an extraordinary horny protuberance by which it is surmounted, nearly as large as the bill itself, and of cellular structure within. The rhinoceros hornbill (*Bucĕros rhinoceros*) is almost the size of a turkey, of a black color, except on the lower part of the belly and tip of the tail, which are white. It

Rhinoceros Hornbill (*Bucĕros rhinoceros*)

has a sharp-pointed, slightly-curved bill, about 10 inches long, and furnished at the base of the upper mandible with an immense appendage in the form of an inverted horn. The skeleton though bulky is very light, being permeated with air to an unusual degree. During incubation the female is plastered up in the hollow of a tree and fed by the male through a small aperture left for the purpose. The hornbills are of arboreal habit, and feed on fruits; but in captivity they take small reptiles, and the Abyssinian species even attacks snakes.

Hornblende (hōrn'blend), or AMPHIBOLE, one of the most abundant and widely diffused of minerals, remarkable on account of the various forms and compositions of its crystals and crystalline particles, and of its exceedingly diversified colors, thus giving rise to almost numberless varieties, many of which have obtained distinct appellations. It is sometimes in regular distinct crystals, more generally the result of confused crystallization, appearing in masses composed of laminæ, acicular crystals, or fibres, variously aggregated. It enters largely into the composition and forms a constituent part of several of the trap-rocks, and is an important constituent of several species of metamorphic rocks, as gneiss and granite. In color hornblende exhibits various shades of green, often inclining to brown, white

and black with every intermediate shade; it is nearly transparent in some varieties, in others opaque; hardness about the same with felspar; specific gravity, 3.00. Its chief constituents are silica, magnesia and alumina. The principal varieties are hornblende proper, divided into three subvarieties, basaltic hornblende, common hornblende and hornblende slate; tremolite, actinolite, nephrite, pargasite and asbestos.

Hornbook (hōrn'bŭk), in former times the first book of children, or that in which they learned their letters; so called from the transparent horn covering placed over the single page of which it usually consisted, the whole being fixed to a wooden frame with a handle. It generally contained the alphabet in Roman and small letters, several rows of monosyllables, and the Lord's Prayer. The alphabet was usually prefaced with a cross, or was printed in the form of a cross; hence the term Christ-cross row, corrupted into *criss-cross* row, applied to the alphabet, and by extension to the hornbook.

Hornbook.

Horncastle (hōrn'kas-tl), a town of England, County of Lincoln, 21 miles east of the city of Lincoln. There is a considerable trade in corn and wool, and one of the largest horse-fairs in the United Kingdom is held annually in August. Pop. 3900.

Horne (hōrn), Richard Hengist, poet, dramatist, and miscellaneous writer; born at London about 1803; died in 1884. He was educated for the army at Sandhurst, entered the Mexican navy, and served during the war between Mexico and Spain. In 1828 he began his literary career, and produced several tragi-comedies of an ironical and satirical kind, and a large quantity of miscellaneous work. In 1843 he made his historic appeal to public judgment by publishing his epic *Orion* at one farthing. In 1844 *A New Spirit of the Age*, a critical work in which he was assisted by Miss Barrett (Mrs. Browning) and Robert Bell, appeared. In 1852 he took to gold-digging in Australia, still keeping in touch with his literary work. Of his many writings, the best known are *Orion*, *Cosmo de Medici*, *The Death of Marlowe* and *Prometheus*.

Horned Horse, the gnu (which see).

Horned Owl, a familiar name applied to several species of owls having two tufts of feathers on the head, supposed to resemble horns. See *Owls*.

Horned Pout. See *Catfish*.

Horned Screamer (*Palamedea cornūta*), a South American grallatorial bird having a long, slender, movable horn projecting from its forehead. Its voice is loud and shrill, and is uttered suddenly and with such vehemence as to have a very startling effect.

Horned Toad, a name given to a genus of lizards (*Phrynosōma*), of toad-like appearance, found in the United States.

Hornell (hor-nel'), a city of Steuben Co., New York, on Canistea River, 56 miles s. of Rochester, on the Erie and the Pittsburgh, Shawmut & Northern railroads. It has car shops, iron foundry, and manufactures of silk, gloves, interior woodwork, furniture, electrical machinery, etc. Pop. (1910) 13,617; (1920) 15,025.

Horner (hōr'nẽr), Francis, politician and economist, born at Edinburgh in 1778; died at Pisa in 1817. He studied for the Scottish bar, but, exchanging it for the English bar, took up his residence in London in 1803. He had early, with his friends Jeffrey and Brougham, declared his preference for Whig principles, and in 1806, when Mr. Fox came into office, obtained through ministerial influence a seat in Parliament. He became an authority on financial and economic matters; was chairman of the Bullion Committee of 1810, and was mainly the means of checking the evils of an inconvertible paper currency. He was one of the originators of the *Edinburgh Review*, for which he wrote many articles.

Hornet (hōr'net), an insect of the genus *Vespa* (*V. crabro*), much larger and stronger than the ordinary wasp. It is very voracious feeding on fruit, honey, etc., and preying on other insects. Hornets form their nest of a kind of paper-work in hollow trees and walls, and are able with their sting to inflict a painful wound, usually accompanied with considerable swelling.

Horn of Plenty. See *Cornucopiæ*.

Horn Silver, native chloride of silver, so called because when fused it assumes a horny appearance.

Hornstone. See *Quartz. Chert*.

Hornwork, in fortification, a work with one front only

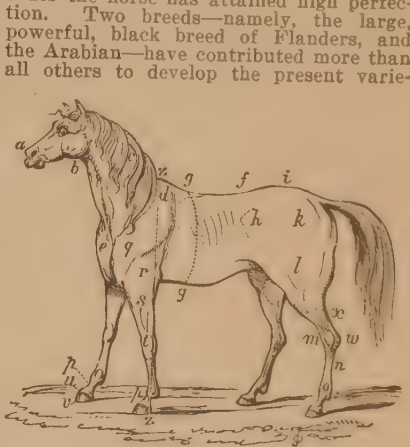
thrown out beyond the glacis for the purpose of either occupying rising ground, barring a defile, covering a bridge-head, or protecting buildings.

Horology (hor-ol'ō-ji). See *Clock* and *Watch*.

Horoscope (hor'u-skōp), in astrology, a scheme or figure of the twelve houses, or twelve signs of the zodiac, in which is marked the disposition of the heavens at a given time and place, and by which astrologers formerly told the fortunes of persons, according to the position of the stars at the time of their birth. To each of the houses was assigned a particular virtue or influence. The ascendant was that part of the heavens which was rising in the east at the moment; this was the first and most important house, or house of life, and contained the five degrees above the horizon and the twenty-five beneath it. Other houses were those of riches, marriage, death, etc.

Horsa. See *Hengist*.

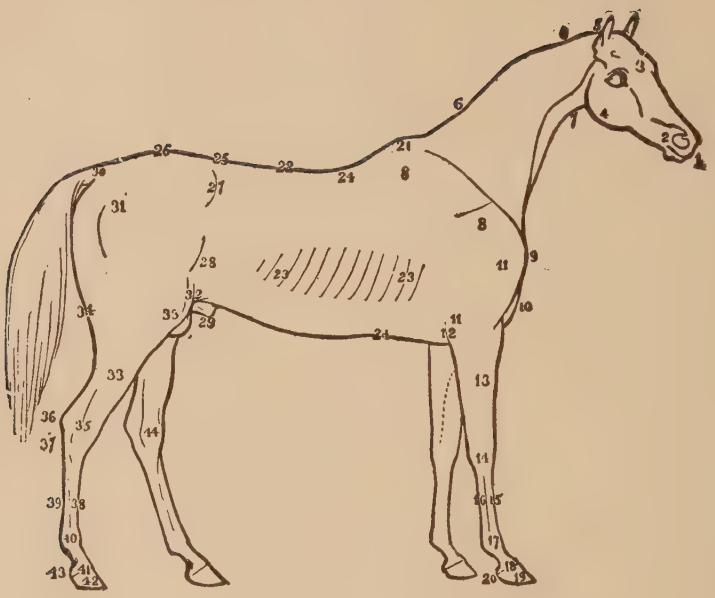
Horse (*Equus caballus*), a well-known quadruped belonging to the family Equidæ, order Ungulata (hoofed animals), and subdivision Perissodactyla (odd-toed); characterized by an undivided hoof formed by the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth in each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the male, rarely in the female. The family includes also the asses and zebras, and original types appear to have been at one time common in both the Old World and the American continent. No horses existed in America when it was discovered by Columbus, those now found in a wild state there being descendants of those introduced by the Spaniards. But a number of fossil species have been described from America—one of them standing only two and a half feet in height. The descent of the present horse can be traced through several fossil forms back to an animal only about the size of a fox, and having four separate digits or toes on the feet. Subsequent forms show how the third toe developed at the expense of the others till eventually a form identical with the common horse appeared. It is doubtful whether the horse is now anywhere to be found in its native state, the wild horses of the steppes of Tartary and other regions of the Old World being possibly descendants of animals escaped from domestication. The horse was probably first domesticated in Asia, and it varies much in form, size, and character with the climate and nature of the district it inhabits. Arabia produces perhaps the most beautiful breed, which is also swift, courageous, endurant and persevering. As bred in modern times the horse has attained high perfection. Two breeds—namely, the large, powerful, black breed of Flanders, and the Arabian—have contributed more than all others to develop the present varie-



Horse—Terms Applied to Different Parts.

a, Muzzle. *b*, Gullet. *c*, Crest. *d*, Withers. *e*, Chest. *f*, Loins. *g g*, Girth. *h*, Hip or ilium. *i*, Croup. *k*, Haunch or quarters. *l*, Thigh. *m*, Hock. *n*, Shank or cannon. *o*, Fetlock. *p*, Pastern. *q*, Shoulder-bone or scapula. *r*, Elbow. *s*, Fore thigh or arm. *t*, Knee. *u*, Coronet. *v*, Hoof. *w*, Point of hock. *x*, Hamstring. *z z*, Height.

ties from the original, comparatively light-limbed, wiry race. The former laid the foundation of size, strength and vigor for draught horses and for those anciently used in war, while the latter conferred speed and endurance. The ladies' palfrey is largely derived from the Spanish genet, a small, beautiful, fleet variety of the Moorish barb. The hunter, characterized by speed, strength and endurance, represents the old English, Flanders and Arabian breeds. The race horse has less of Flemish and more of Arabian blood. Horses are said to have 'blood' or 'breeding' in proportion as they have a greater or less strain of Arab blood. At the age of two years the horse is in a condition to propagate. The mare carries her young eleven months and some days, continues to breed till the age of sixteen or eighteen years, and lives on an average between twenty and thirty years. The various species of the horse family have been artificially crossed by man, and are found to be fertile with each other; the offspring, however, are generally sterile.



POINTS OF THE HORSE

HEAD

1. Muzzle
2. Nostril
3. Forehead
4. Jaw
5. Poll

NECK

6. 6. Crest
7. Thropple or windpipe

FORE-QUARTER

8. 8. Shoulder-blade
9. Point of shoulder
10. Bosom or breast
11. 11. True-arm
12. Elbow
13. Forearm (arm)
14. Knee
15. Cannon-bone
16. Back sinew
17. Fetlock or pastern-joint
18. Coronet
19. Hoof or foot
20. Heel

BODY OR MIDDLEPIECE

21. Withers
22. Back
23. 23. Ribs (forming together the barrel or chest)
24. 24. The circumference of the chest at this point, called the girth
25. The loins
26. The croup
27. The hip
28. The flank
29. The sheath
30. The root of the dock or tail

THE HIND-QUARTER

31. The hip-joint, round or whirl-bone
32. The stifle joint
33. 33. Lower thigh or gaskin
34. The quarters
35. The hock
36. The point of the hock
37. The curb place
38. The cannon-bone
39. The back sinew
40. Pastern or fetlock-joint
41. Coronet
42. Foot or hoof
43. Heel
44. Spavin-place

The horse is, strictly speaking, an herbivorous animal, and is more scrupulous in the choice of his food than most other domestic quadrupeds. The staple diet on which horses are kept is oats and hay, with beans added for horses subjected to heavy work. As a substitute for, or an addition to the regular food, bran, linseed and carrots are used. The age of a horse can be told by the marks on its teeth, which change a little yearly until the animal is about nine years old, after which period it is difficult to determine the age by mark. In some countries the flesh of the horse is used as food; the hide is made into leather; and the hair of the mane and tail is used for making haircloth, for upholsterers' stuffing, etc.

Horse-chestnut, a handsome genus of trees or shrubs (*Æscŭlus*) belonging to the nat. order Sapindaceæ, having large opposite digitate leaves, and terminal panicles of showy white, yellow, or red flowers. *Æ. Hippocastănum* (the common horse-chestnut) is familiar to every one. The seeds are large and farinaceous, and have been used as food for animals; they are bitter, and the bark is also bitter, astringent and febrifugal. The tree is said to have been brought from Constantinople to England in the beginning of the sixteenth century, and is supposed to be a native of Northern Asia. Three other species are found in North America, where they are popularly known under the name of *Buckeye.*

Horse-fly, the *Hippobosca equina,* a winged genus of the family Hippoboscidæ, parasitical on the horse.

Horse-guards, the name given to the public office, Whitehall, London, appropriated to the departments under the commander-in-chief of the British army; applied also to the military authorities at the head of the war department, in contradistinction to the civil chief, the secretary-at-war. The name was given to the building from a guard having been kept there by the horse-guards. See *Guards.*

Horse-latitudes, a space in the Atlantic Ocean between the westerly winds of higher latitudes and the trade-winds, notorious for baffling winds and tedious calms.

Horse Mackerel. See *Blue-fish* and *Scad.*

Horsens, a seaport in Denmark, east coast of Jutland, on a fiord of the same name, 25 miles S. W. of Aarhuus. It has manufactures of tobacco and a good general trade. It is the birthplace of Vitus Behring, the discoverer of Behring Strait. Pop. 22,243.

Horse-power, the power of a horse or its equivalent; the force with which a horse acts when drawing. The mode of ascertaining a horse's power is to find what weight he can raise and to what height in a given time, the horse being supposed to pull horizontally. From a variety of experiments of this sort it is found that a horse, at an average, can raise 160 lbs. weight at the velocity of 2½ miles per hour. The power of a horse exerted in this way is made the standard for estimating the power of a steam engine. Thus we speak of an engine of 60 or 80 horse-power, each horse-power being estimated as equivalent to 33,000 lbs. raised one foot high per minute. Engineers differ widely in their estimate of the work a horse is able to execute. That given above is the estimate of Boulton and Watt based on the work of London dray-horses, but it is considered much too high, 17,400 foot-pounds per minute being generally considered nearer the truth. As it matters little, however, what standard be assumed, provided it be uniformly used, that of Watt has been generally adopted. The general rule for estimating the power of a steam engine in terms of this unit is to multiply together the pressure in pounds on a square inch of the piston, the area of the piston in inches, the length of the stroke in feet, and the number of strokes per minute, the result divided by 33,000 will give the horse-power, deducting one-tenth for friction. As a horse can exert its full force only for about six hours a day, one horse-power of machinery is equal to that of 4.4 horses. *Nominal* or *calculated horse-power* is a term still used, but of little real value, from its being calculated on steam at a pressure much below the real power exerted. Sometimes the *real, actual,* or *indicated horse-power* exceeds the *nominal* by as much as three to one.

Horse-racing, a sport of ancient origin, having been practised among the Greeks and Romans. The institution of horse races in England belongs to a very remote period. The first regular horse races, however, did not take place till the reign of James I. The prize then consisted of a gold or silver bell, whence we have the expression 'to wear away the bell.' The successors of James I down to Queen Anne were all more or less attached to the sport. Under George I horse-racing became more and more flourishing, and the sport continued to grow in importance during the remainder of the century. The two most celebrated horses of that period were Flying Childers (foaled in 1715)

and Eclipse (foaled in 1764), which long had the reputation of being the fleetest horses that ever ran. The former ran four miles in 6 min. 48 sec., carrying 9 st. 2 lbs. The latter was never beaten. None of the English sovereigns was more devoted to horse-racing than George IV. Between 1784 and 1792, while yet Prince of Wales, he gained 185 prizes, including the Derby of 1788. Horse-racing was introduced into France from England, and during the reign of Louis XIV, and still more during that of Louis XV, was pursued with the utmost enthusiasm. The revolution put an end to it for a time, but the sport was revived by Napoleon. Horse-races, mostly upon the English model, have also been introduced into various other countries. The principal varieties of horse-racing are flat-racing, or racing on level ground; steeple-chasing, or racing over ground not specially prepared for the purpose; hurdle-racing, in which the horses have to leap over obstacles purposely placed in the way; and match trotting. This last kind of race is a very favorite one in the United States, where the best trotting horses are to be found, but in England it is not much practised. Formerly all races were what is called weight-for-age races, that is, a specified difference in weight was conceded by the older horses. But it was found that when races were conducted on this plan the best horses came to be known. and the inferior ones withdrew, not venturing to compete with them, so that the race resulted in a walk-over. Hence arose the practice of handicapping, that is, of adjusting as nearly as possible the weight to be carried to the previously ascertained powers of the horse, so as to reduce the chances of all the horses entered to an exact equality. Since the introduction of this practice, handicap races have become a very favorite sport.

In the American colonies racing was introduced early in the eighteenth century, and was practiced to some extent in Maryland and Virginia by the middle of the century. Bully Rock, the first American thoroughbred, was imported in 1730, and Bonny Lass, a brood mare of fine pedigree, about 1740. After this time racing stock was frequently imported and the racing area extended from New York to the Carolinas. After the Revolutionary war many fine racers were brought over and the stock of blooded horses rapidly increased. But it was the development of the trotting horse to which the chief attention was paid in the United States, and in its trotters this country has grown preëminent. The American trotter began its career in the importation to Philadelphia of the English thoroughbred Messenger in 1788. He was 8 years old when brought over and was used in breeding for 20 years. The trotting instinct appeared in nearly all his descendants and it is to the Messenger stock that much the greater part of the notable trotters in this country is due. The first record of a public trotting match was in 1818, when the gray gelding Boston Blue made a mile in 3 minutes. Such a feat was at that time thought impossible and when 2.40 was reached in 1824, this became a popular phrase signifying marvelous speed. Edwin Forrest trotted a mile in 2.31½ in 1834, while Lady Suffolk made a record of 2.26½ in 1843. Year after year after this the time was cut down, though by small amounts. Dexter in 1867 made a mile in 2.17¼; in 1885 Maud S. cut this down to 2.08¾, and finally in 1897, Star Pointer crossed the 2 minute goal, making a mile in 1.59¼, and Lou Dillon, in 1903, in 1.58½. Pacing records have reached the still lower level of 1.55, made by Dan Patch in 1906. Running is a faster pace than trotting, and the American running record has reached the low limit of 1.35½. This was made by Salvator, at Monmouth Park, in 1890.

Horseradish (*Cochlearia armoracia*), a common garden herb, acrid and stimulating in character. It is used in pharmacy in the preparation of compound spirit of horseradish. Horseradish is used in a fresh state as a condiment with meats.

Horse-tail, among the Turks and other Eastern nations, the tail of a horse mounted on a lance, and used as a standard of rank and honor. The three grades of pashas are distinguished by the number of tails borne on their standards, three being allotted to the highest dignitaries or viziers, two to the governors of the more important provinces, and one only to those of the less important districts of the country.

Horse-tail Standard of Pasha.

Horsham (hôrs'am), a town of England, in the county of Sussex, on a branch of the river Arun, 37 miles S. S. W. of London, and 22 miles N. W. of Brighton. It formerly sent a member to parliament, and now gives name to a parliamentary division of the county. **Pop. (1911) 11,314.**

Horsley (hôrs'li), SAMUEL, English bishop, born in 1733; died in 1806. He was educated at Cambridge, and in 1759 became rector of Newington Butts. In 1767 he was chosen a fellow of the Royal Society, of which he was appointed secretary in 1773. After several charges he was appointed in 1788 Bishop of St. David's, from which he was translated to Rochester in 1793, receiving at the same time the deanery of Westminster; and finally to St. Asaph in 1802, when he resigned his deanery. Dr. Horsley was the greatest theological controversialist of his day, and is famous for his controversy with Priestley on Unitarianism. He published numerous sermons, and several works on Biblical criticism, besides editing an edition of Sir Isaac Newton's works.

Horta (hor'ta), a town in the Island of Fayal, one of the Azores, on the shores of a small bay between two rocky headlands. It has a tolerable harbor, and exports wine, oranges and grain. Pop. 6734.

Hortense (or-tons). EUGENIE DE BEAUHARNAIS. See under *Beauharnais.*

Hortensius (hor-ten'she-us), QUINTUS, a Roman orator, born of an equestrian family B.C. 114; died B.C. 50. He held many military and civil offices, and was elected consul for the year 69 B.C. In the previous year he had been engaged to defend Verres during the famous prosecution in which Cicero acted for the accusers. Hortensius continued to maintain a generous and friendly rivalry with Cicero, acknowledging his superior oratorical powers without jealousy. His speeches are all lost.

Horticulture (hor'ti-kul-tūr; from L. *hortus*, garden, and *colere*, to till), or GARDENING, includes, in its most extensive signification, the cultivation of esculent vegetables, fruits, and ornamental plants. In large gardens there are generally separate departments for flowers, fruits and vegetables; but in small gardens they are usually more or less combined. A garden should be either on a level, but admitting of effectual drainage, or on a gentle slope, preferably on the lower portion of a slope facing the sun. It should be well sheltered, either naturally from situation or artificially by means of plantations, walls, etc. The character of the soil is of much importance. A good loam, or a sandy loam mixed with humus, is the best. The former is better fitted for fruit-trees, but for early crops the sandy loam is desirable. While the greater part of a garden should consist of such soil, either naturally or artificially formed, it is useful to have a portion stronger and another much lighter in order to suit the requirements of different plants. The nature of the subsoil is also important. The best is a dry bed of clay overlying sandstone. Digging, ploughing and pulverizing the soil, and exposing the surface to the action of the summer sun and the winter's frost are highly useful operations, by which the tenacity of stiff soils is overcome, weeds and insects are destroyed, and a quantity of air is admitted into the ground. Nutritive matter is frequently supplied to plants in the form of manure, either organic or inorganic. After the soil is properly dry and pulverized, the seeds are deposited, and this should always be done in dry weather, for a dry soil is especially requisite for covering in the seeds. Watering is often necessary as a means of nourishment to growing plants, especially as a support to newly transplanted vegetables, and for cleaning the leaves and destroying insects. The methods of propagating plants are various. For an account of the processes of budding and grafting see these articles. Another mode of propagation is that by means of cuttings, or shoots cut off and planted in the soil, where they take root. This process is exceedingly simple and easy in the case of many trees, as the willows and poplars; but requires some management in the heaths, myrtles, and other shrubs. In growing ornamental plants and flowers and exotic fruits, plant-houses of various kinds are necessary. These comprise the numerous forms of conservatory, plant-stove, greenhouse, pits and frames. Horticultural tools, instruments, implements and machinery are very various.

Hortus Siccus. See *Herbarium.*

Horus (hōr'us), the Latinized form of *Har.* the day, or the sun's path, an Egyptian divinity. Two gods were latterly recognized under the name. The elder Horus was the son of Seb (identified by the Greeks with Kronos) and Nu (Rhea) and brother of Osiris. The other Horus was the son of Osiris and Isis, and is supposed to have come into the world soon after the birth of his parents. On the death of Osiris he was his avenger, defeating the serpent

Typho, and enabling Isis to thwart his wicked designs. Both the elder and younger Horus were regarded as symbols of the sun.

Horus Apollo. See *Horapollo.*

Hosanna (hō-zan'a), a word composed of two Hebrew words occurring in Psalm cxviii, 25, signifying 'save now.' The psalm was sung on joyful occasions, and particularly at the feast of Tabernacles. The phrase is used as an exclamation of praise to God, or an invocation of blessings.

Hosea (hō-sē'a), the first in order among the minor prophets of the Old Testament, but probably the third in order of time, flourishing about 750 B. C. Nothing is known of his life, except that he was the son of Beeri, and that his ministry belonged to the reigns of Uzziah, Jotham, Ahaz and Hezekiah, kings of Judah. The nation generally and the ten tribes in particular are reproved, exhorted, and threatened in his prophecy. He predicts the approaching exile of his countrymen, and the consoling promise of the final return of an improved people.

Hoshangábád (hō-shang'ä-bäd), chief town and headquarters of district of the same name, Central Provinces of India, on the Nerbudda. It is a chief seat of the British piece-goods trade, and does business in cotton, grain, etc. Pop. about 15,000. The district has an area of 4437 sq. miles.

Hoshiarpur (hō'shē-ar-pōr), chief town and seat of administration of district of same name, Punjab, India. Pop. about 20,000. The district has an area of 2180 sq. miles.

Hosiery (hō'zher-i), a general term all kinds of knitted articles, including drawers, petticoats, nightdresses, etc., and fancy articles such as head-dresses, hoods, shawls, neckerchiefs, watch-guards, cravats, etc. The materials used for the purpose are cotton, linen and wool, the last of which is sometimes mixed with cotton or silk. Silk is also frequently used alone. Nearly all articles of hosiery, except some fancy articles, are now made by a knitting-frame of some kind or other.

Hosmer (hos'mer), HARRIET, sculptor, born at Watertown, Massachusetts, in 1831. She studied at Rome, and among her best-known works are ideal heads of *Daphne and Medusa, Puck,* the *Sleeping Faun, Waking Faun, Beatrice Cenci,* etc. She died in 1908.

Hospice (hos'pis), signifies either a little convent belonging to a religious order, occupied by a few monks, and destined to receive and entertain traveling monks; or houses of refuge and entertainment for travelers on some difficult road or pass, as the Hospice of the Great St. Bernard.

Hospital (hos'pi-tal), any building appropriated for the reception of any class of persons who are unable to supply their own wants, and are more or less dependent upon public help to have those wants supplied. Hence hospitals are of various kinds, according to the nature of the wants they supply and the class of persons for whom they are intended. A large number of hospitals are medical; others are for the reception of incurables; others for the aged and infirm; others for the education of children of people in reduced circumstances; others for the reception of the wounded in battle; and so on. The first establishments of this nature are believed to belong to the fourth century after Christ. Their primary object was to afford a shelter to strangers and travelers, and it was only occasionally that the sick and infirm were admitted. One of the earliest hospitals of which we have any satisfactory information was that established by the emperor Valens at Cæsarea about the end of the fourth century, and which was conducted on a very large scale. The Arabs in Spain, at an early period of their occupation of that country, founded a magnificent hospital at Cordova, where physicians were trained, who did a vast deal to advance the study of medicine. The Arabs have also the credit of having founded the first lunatic asylum in Europe, which was erected in the city of diseases), fever and smallpox hospitals. everywhere are medical, often called infirmaries. These may be divided into general and special hospitals, the former class admitting cases of all kinds; the latter class admitting only patients suffering from some special trouble. Thus there are lying-in hospitals, cancer, consumption, ophthalmic, lock (for venereal diseases), fever and smallpox hospitals. There are also hospitals for children, and for persons suffering from incurable diseases. Such institutions serve a double purpose, inasmuch as they not only afford the best medical advice and treatment to the poor, who would otherwise be unable to obtain it, but also supply the best means of giving instruction in medicine and surgery, as in them students have the opportunity of witnessing cases of nearly every variety of disease and observing how they are treated by the most skilled physicians and surgeons. For this reason a good infirmary or medical hospital is an indispensable adjunct

to every school of medicine and surgery. Hospitals for the sick and hurt are usually divided into wards, each containing a larger or smaller number of beds. Medical and surgical wards are usually kept separate, and all contagious diseases are treated by themselves in distinct buildings. Each hospital has a matron, house surgeon, and apothecary resident within its walls. The duties of the matron consist in regulating the night and day nurses, and the washing and laundry department, as well as the purchase of the necessary supplies of provisions, and keeping a general superintendence over the kitchen and messes of the sick. The house surgeon takes care of all casualties and accidents in the absence of the principal surgeons. The apothecary takes care of the pharmacy and prepares all the medicines prescribed from time to time by the surgeons and physicians. There is a well-lighted room set apart for the performance of operations, and a mortuary for the reception of corpses previous to interment. The nurses relieve each other day and night in a regular manner. Particular wards are set aside for the reception of persons laboring under various and peculiar denominations of disease. It has been objected to the present plan of constructing large edifices for hospital purposes, that the benefit they confer is greatly diminished by the risk of being attacked by hospital diseases, fever, erysipelas, pyæmia, etc., to which the patients are exposed; and the cottage or hut system of construction has been strongly advocated. This form of hospital consists of temporary detached huts or cottages which could be easily removed or replaced. Difficulties in connection with expense and administration have made this system impracticable. The pavilion system of construction is a compromise between the large blocks and the cottages or huts. According to this system the wards should be separated from the administrative part of the establishment, and should be arranged in pavilions of one story where practicable, but never more than of two The pavilion should always surround the administrative blocks. This mode of construction is equally applicable to large and small establishments. The Royal Infirmary of Edinburgh, the Herbert Hospital of Woolwich, and the New York Hospital are among the best examples of the pavilion style. Convalescent homes, where patients are reinvigorated by a short stay after being cured in the infirmary, may be regarded as supplementary to medical hospitals, and among subsidiary institutions are dispensaries (which see) and schools for the training of nurses. Special hospitals for the insane are necessary. Hospitals or asylums for inebriates have also been organized; likewise hospitals for opium habitues, and those addicted to the use of other narcotics. The subject of the proper training of nurses has received great attention. Training schools have been organized in connection with nearly all the larger American hospitals and to the special work of nurses within the hospitals has been added that of social service, which follows discharged patients, into their homes and seeks to improve conditions there, so that recovery may be full and the patient not returned to the hospital for further treatment. Most hospitals in the city maintain an ambulance, or large covered wagon, equipped with a bed, instruments and restoratives, for the transportation of the sick or wounded to the hospital, each ambulance being provided with a surgeon, who applies first aid and cares for the patient en route.

Military and Naval Hospitals or establishments for the reception and care of sick and wounded soldiers and seamen, have been in existence in all civilized countries for a long period. Military hospitals are either permanent or temporary establishments. Permanent hospitals are established at army posts or forts, as also at certain other places. Field hospitals are constructed at the scene of an engagement as may be demanded, and are transported from point to point. They usually consist of tents, with stretchers for conveying the wounded. Station hospitals are established at intervals during a campaign, between the seat of war and the base of supplies, and patients are conveyed from the field hospitals to them as occasion requires. *Hospital ships* are ships fitted out as hospitals in all expeditions beyond the sea. By intelligent treatment the mortality in war has rapidly decreased.

Hospitallers (hos-pi-tal'ėrs), charitable brotherhoods who devote themselves to tend the sick in hospitals. The name is specially applied to an order of knights, the Knights of St. John. See *John, Knights of St.*

Hospodar (hos'po-dâr), a title of dignity borne by the vassal princes of Moldavia and Wallachia while those states were subject to Turkey, and in earlier times by the princes of Lithuania and the kings of Poland.

Host (hōst; Latin *hostia*, a sacrificial victim), a term used for the bread (or wafer) and wine in the eucharist, as containing the body and blood of Christ. As the wafer alone is

given to laymen in the Roman Catholic Church, as containing both the body and blood of the Redeemer, the term *host* is usually applied to the consecrated wafer. See *Elevation, Mass.*

Hostage (hŏst'aj), a person left as pledge or surety for the performance of the articles or conditions of a treaty. The taking or giving of hostages is now scarcely known in the relations of modern communities, but was formerly almost universal, and many questions in the law of nations arose out of the practice. If the stipulated terms were observed the hostages were returned on each side, but if the terms were violated or evaded the hostages might be put to death.

Hostilius. See *Tullus Hostilius.*

Hot Air Engine an engine in which the expansion of heated air is used as the motive power. Several devices of this kind have been invented, of which the most successful has been that of Ericsson. This has been considerably improved, and is now in use to some extent where small power is needed. There are several others in use, that of Belom being the only one used to furnish large power for an important industry, a large paper manufactory at Cusset, France. The chief advantage of the hot air engine is that it requires no boiler, and thus escapes the weight and danger incident to this necessity of a steam engine. On the other hand, the pressure to be obtained from hot air is much less than that of steam, and the working parts need to be much larger. But air engines are cheaper to make, more easily managed, and need less care than steam engines.

Hotbed, in gardening, a bed of earth heated by fermenting substances, such as fresh stable dung, tanners' bark, leaves of trees, etc., and covered with glass to defend it from the cold air; intended for raising early plants, or for nourishing exotic plants of warm climates, which will not thrive in cool or temperate air.

Hot Blast, a stream of air heated to 500° or 600° F., and forced through a furnace. It saves heat and accomplishes the reduction of refractory ores in less time and with less fuel than the cold blast.

Hotchkiss, BENJAMIN BERKELY, inventor, born at Watertown, Connecticut, in 1826. The most notable of his inventions were the Hotchkiss magazine rifle and Hotchkiss machine gun. He made many improvements in projectiles and heavy ordnance. He died in 1885.

Hothouse, a building for the cultivation of plants too delicate to grow in the open air. It is built chiefly of glass, and resembles a greenhouse in its structure and arrangements, except that artificial heat is kept up all the year round.

Hot Springs, a city and noted health resort, capital of Garland county, Arkansas, 54 miles S. W. of Little Rock. The springs number 72, their water varying from 76° to 157° F. It is clear, tasteless and odorless, and is credited with curing rheumatism, gout, neuralgia and other chronic diseases. Fine novaculite (oilstone) is found here, and hones are manufactured. Lead and silver also occur. Pop. (1920) 11,695.

Hotspur. See *Percy.*

Hottentots (hot'en-tots), a peculiar African race, supposed to be the aboriginal occupants of the south end of Africa, at and near the Cape of Good Hope. Their limits may be said to have been the river Orange on the north and northeast, and the Kei on the east. When young they are of remarkable symmetry; but their faces are ugly, and this ugliness increases with age. The complexion is a pale olive, the cheek-bones project, the chin is narrow and pointed, and the face consequently is triangular. The lips are thick, the nose flat, the nostrils wide, the hair woolly, and the beard scanty. When the Dutch first settled at the Cape in the middle of the seventeenth century the Hottentots were a numerous nation, of pastoral and partially nomadic habits, and occupied a territory of 100,000 square miles. At the present day this race is nearly extinct within the wide territory which formerly belonged to it, having been entirely hunted out and dispersed by the Boers. Among the offshoots of the Hottentot race are the Griquas, descended from Hottentot mothers and Dutch fathers, living to the north of the Orange river. They are semicivilized, and have some towns and villages. The Koras or Korannas, higher up the river Orange or Gariep, still remain a favorable specimen of the Hottentot race. They are taller, stronger, and more cleanly than the tribes further west. Other tribes are the Gonas or Gonaquas, much mixed with the Amakosa Kaffirs; the Namaquas, dwelling towards the mouth of the river Orange; the Hill Damaras, farther north. The diminutive Bushmen are related in speech to the Hottentots. The language of the

Hottentots is peculiar, consisting of a system of clicks or clucks.

Hottentot's Bread. See *Testudinaria.*

Houghton (hō'tun), RICHARD MONCKTON MILNES, LORD, only son of Robert Pemberton Milnes, of Fryston Hall and Great Houghton, was born in Yorkshire in 1809, and educated at Cambridge. He made some reputation as a writer of verse, essays, memoirs, etc., but it was rather his social and conversational powers, and his kindly patronage of literary aspirants, than the merit of his writings which gave him his prominent position in London society. In 1837 he entered parliament as member for Pontefract, at first as a Tory, but afterwards as a supporter of Russell and Palmerston. He was an active member of numerous learned societies and institutions, president of the Royal Society of Literature, trustee of the British Museum, foreign secretary of the Royal Academy, etc. He died in 1885.

Houghton, a village, capital of Houghton County, Michigan, on the S. shore of Portage Lake, from which is a ship canal to Lake Superior. It is the seat of very productive copper mines, with smelters. The Michigan College of Mines is located here. Pop. (1920) 4466.

Houlton (hōl'tun), shire town of Aroostook Co., Maine, 140 miles N. E. of Bangor. It is a trading and agricultural center and has woolen mill, foundry, machine shops, fertilizer factory, saw and planing mills, starch factories, grist and flour mill, etc. Pop. (1920) 6191.

Houma (hō'ma), a town, county seat of Terrebonne Parish, Louisiana, 50 miles S. W. of New Orleans, at the junction of six navigable bayous. It is the center of a sugar-producing area and is noted also for its oysters, furs and lumber. Its raw-oyster industry is rated as second in the United States. Pop. (1920) 5160.

Hound (*Canis sagax*), a name given generally to hunting dogs, but restricted by scientific writers to such as hunt by scent, a definition which excludes the greyhound. Among the varieties are the bloodhound, staghound, foxhound, harrier and beagle. Hounds are distinguished not only by their fineness of scent, but by docility and sagacity. Of the rough-haired and smooth-haired varieties, the former manifest the greatest affection for man.

Hounds-tongue, a plant, so called from the shape of its leaves. See *Cynoglossum.*

Hounslow (hounz'lō), a town of England, in Middlesex, 9 miles southwest of Hyde Park Corner, London. The adjoining Hounslow Heath, once notorious for the highway robberies

Deerhound (*Canis sagax*).

committed on it, is now entirely enclosed, and is the site of large cavalry barracks and extensive powder mills.

Hou-Pe (hō-pā'), HU-PEH, or HOO-PE (North of the Lakes), a central province of China. It is intersected by the Han-kiang and the Yang-tse-kiang, and is considered one of the most fertile parts of the empire. Area, about 70,000 sq. miles. Pop. estimated at 34,000,000.

Hour (our), the twenty-fourth part of a day (see *Day*). In most countries the hours are counted from midnight to mid-day, and twelve hours are twice reckoned. But in some parts of Italy twenty-four hours are counted, beginning with sunset, so that noon and midnight are every day at different hours. Each hour is divided into sixty minutes, and each minute into sixty seconds.

Hour-circle. See *Globe.*

Hour-glass, an instrument for measuring time, consisting usually of two hollow bulbs placed one above the other, and having a narrow neck of communication through which a certain quantity of dry sand, water, or mercury is allowed to run from the upper to the lower bulb, the quantity of sand being adjusted so as to occupy an hour in passing from one bulb to the other. The hour-glass was commonly used in churches during the sixteenth and seventeenth centuries to regulate the length of the sermon.

Houris (hou'riz or hō'riz), the 'black-eyed' nymphs of Paradise, whose company, according to the *Koran,* is to be one of the rewards of the faithful. They are described as most beautiful virgins, endowed with perpetual

youth, and subject to no impurity. They dwell in beautiful gardens, by flowing streams, and the meanest of the faithful will have at least seventy-two of them.

Hours. See *Horæ.*

Hours, Canonical. See *Horæ canonicæ.*

House, Edward Mandell, born at Houston, Texas, in 1858, took an active part in Democratic politics in that state. While never holding office, he directed many campaigns for governor. During the European war, under the informal title of Colonel, he served in 1915 as the special representative of President Wilson in Europe and in December, 1917, became the chief American member of the International Council of the Entente Allies.

House Boat, a form of summer water residence now very popular. It consists of a flat-bottomed scow or float, on which is built a superstructure of several rooms, with balconies, awnings, etc., and often luxuriously furnished. During the pleasant season the house boat is moved from place to place on inland waters as desired. House boats are growing rapidly in favor in the United States and are very common on the Thames and some other rivers of England.

House-breaking. See *Burglary.*

Housefly. See *Fly.*

Household Gods, among the Romans, deities known as the Lares and Penātes, and presiding over the fortunes of the house or family.

Household Suffrage, suffrage based on the occupancy of a house or a distinct part of a house for not less than a year. In Britain it was established in boroughs by the Reform Act of 1867, and extended to the counties in 1884. Lodgers occupying lodgings which would let unfurnished for £10 a year are also entitled to rank under this suffrage.

Household Troops. See *Guards.*

Houseleek (hous'lēk; *Sempervīvum tectōrum*, nat. order Crassulaceæ), a succulent plant, commonly to be met with on old walls, the roofs of cottages, etc. The stem rises to the height of 8 or 10 inches, and bears a few purplish flowers, which have twelve or fifteen petals. The leaves are applied by the common people to bruises and old ulcers.

Housemaid's Knee, an acute inflammation of the bursa or sac between the knee-pan and the skin, so called because it is common among housemaids from their kneeling on hard, damp stones. It is treated like other local inflammations by counter-irritants, and if necessary incision. In all cases the limb ought to have complete rest.

House of Commons. See *Britain;* —section Parliament; also *Parliament.*

House of Correction, a prison for idle and disorderly persons, and certain classes of criminals, such as prisoners convicted of felony or misdemeanor, vagrancy, etc., or committed on charge of such. Originally vagrants, trespassers and convicted persons were detained in these houses that they might be compelled to work. They are sometimes called *bridewells.* In England every county must have one. They have been adopted in the large cities of the United States.

House of Governors, The first suggestion of a body under this title was made in 1907 in a pamphlet by William George Jordan of New York, its purpose being to bring about harmony in state legislation and a closer unity of the States in all particulars. Such a convention of governors was called by President Roosevelt in November of the same year, its purpose being to consider the conservation of the natural resources of the country. The governors of 37 States and Territories attended this convention and the governors themselves called a second one, to be held in January, 1910. This adopted the title of House of Governors. Its purpose was to bring about, through state action, that political harmony which the general government has of late been striving to develop. A session was held at Spring Lake, N. J., in September, 1911, at which steps were taken towards establishing a permanent headquarters and provide for future meetings.

House of Lords. See *Britain;* also *Parliament.*

House of Representatives. See *Congress.*

Houssa, or Haussa (hous'sa), a region of Africa, in Central Soudan, between lat. 11° and 14° N.; and lon. 4° and 11° E. This country, though yet little known, is represented as extremely fertile, and skilfully cultivated. It is under the rule of the Fellatahs, who have subjected the native inhabitants, the Haussana or Haussas, a race intermediate between the negroes and the Berbers, but generally ranked with the

latter. They are intelligent and lively, expert weavers as well as agriculturists, and well acquainted with tanning and working in iron. Their language is rich and sonorous, and has become the general medium of commercial intercourse in Central Africa. They are Mohammedans. There are two large towns in Houssa—Sokoto and Kashna.

Houston, (hūs'tun), a city and port, county seat of Harris Co., Texas, on Houston Ship Channel, an arm of Galveston Bay, 48 miles N. W. of Gal-

veston. It is the great railway center of the State, and has steamer connection with home and foreign ports through the Houston Ship Canal. It has great cotton, lumber and oil interests, with refineries, cottonseed oil mills, foundries, machine shops, railroad car shops and many other industries. Pop. (1900) 44,633; (1910) 78,800; (1920) 138,276.

Houston, SAMUEL, President of Texas, was born in Virginia in 1793, of Scotch-Irish descent. He was taken to Tennessee in childhood, studied law and practiced at Nashville, and became prominent in the State, being elected to Congress in 1823, and made governor in 1827. He subsequently resigned this office, lived several years among the Cherokee Indians, and in 1832 went to Texas. Here he was active in the revolt of Texas against Mexico, was chosen commander of the army and in 1836 defeated the Mexicans at San Jacinto, which resulted in the independence of Texas, of which he was elected President. In 1845 Texas entered the Union, and Houston was chosen United States Senator. He was elected Governor of Texas in 1859. In 1861 he was deposed for adherence to the Union. He died in 1863.

Houston, DAVID FRANKLIN, an American cabinet officer, born at Monroe, N. C., in 1866. In 1913 he was appointed Secretary of Agriculture; Secretary of the Treasury in 1920.

Hovenden (hu v'en-den), THOMAS, painter, born at Dunmanway, Ireland, in 1840, studied art at Cork and in New York, was elected a member of the National Academy in 1882. His *Breaking the Home Ties* was very popular. Other pictures were *The Last Moments of John Brown, Elaine, A Breton Interior*, etc. He was killed while trying to save a little girl from a railroad train, in 1895.

Howard (hou'ard), the patrician house that has been for centuries at the head of the English nobility. The first of the family of whom anything is certainly known is Sir William Howard, chief-justice of the common pleas under Edward I and Edward II. His grandson, Sir John Howard, possessed extensive property in Norfolk, and was also sheriff of the county. His grandson, Sir Robert Howard, by marrying the co-heiress of the Mowbrays, dukes of Norfolk, greatly increased the family possessions, and enhanced the family importance. Their only son, Sir John Howard, distinguished himself in the wars with France in 1452-53, and in 1470 was created Lord Howard, and made captain-general of the royal forces at sea. Adhering to the fortunes of Richard III he was in 1483 created Duke of Norfolk, and elevated to the high dignity of Earl-marshal of England, but two years after he was killed at Bosworth Field, and his blood and honors were attainted by parliament, 1485. A like attainder was decreed against his son Thomas, who had been created Earl of Surrey by Richard. Thomas, however, was restored to his titles and possessions, manifested high military talent, and distinguished himself, especially by his defeat of James IV of Scotland at Flodden in 1513. His son Thomas, third duke of Norfolk, obtained distinction both as a naval and military commander, and became High-admiral of England. But in spite of his services both at home and against the Scots and the French, Henry VIII at last condemned him, on slight grounds, to suffer the death of a traitor. The death of Henry prevented the execution, and he was reinstated in his rank and property by Queen Mary, and died in August, 1554. By his marriage with a daughter of Edward IV he became the father of the ill-fated and ac-

complished Henry Howard, Earl of Surrey, the best English poet of his age. (See *Surrey, Earl of.*) Thomas, fourth duke of Norfolk, entertained the project of marrying Mary Queen of Scots, which led to him being convicted of high treason, and beheaded in 1572. The attainder was reversed and the family honors restored, partly by James I and partly by Charles II. The ducal house of Norfolk has thrown out many branches which have enjoyed, or still enjoy, the earldoms of Carlisle, Suffolk, Berkshire, Northampton, Arundel, Wicklow, Norwich and Effingham, and the baronies of Bindon, Howard de Walden, Howard of Castle Rising, and Howard of Glossop. As connected with this noble family we may mention Lord Howard of Effingham, who defeated the Spanish Armada in 1588; Catherine Howard, one of the ill-fated consorts of Henry VIII; and Sir Thomas Howard, who died in the Tower a prisoner, for having aspired to the hand of the Lady Margaret Douglas, daughter of Margaret, queen-dowager of Scotland, and niece of Henry VIII. 'The blood of the Howards' has become proverbial, as expressive of ancient lineage combined with high rank.

Howard, Bronson, playwright, born at Detroit, Michigan, in 1842; died in 1908. His best-known plays are *Saratoga, Young Mrs. Winthrop, Shenandoah* and *The Banker's Daughter.*

Howard, John, an English philanthropist, was born in 1726; and died in 1790. His father, a wealthy London tradesman, died when his son was about 19 years of age, and left him an independent fortune. In 1756 Howard undertook a voyage to Lisbon to view the effects of the recent earthquake. The vessel in which he embarked being captured, he was consigned to a French prison. The hardships he suffered and witnessed previously to his release first roused his attention to the subject of his future researches. In 1773 he resolved to devote his time to the investigation of the means of correcting the existing abuses in the management of prisons. With this view he visited most of the English county jails and houses of correction, and in March, 1774, he laid the result of his inquiries before the House of Commons, for which he received a vote of thanks. In 1775 and 1776 he visited many of the continental prisons, as well as those of Scotland and Ireland, and the substance of his investigations appeared in a work he published in 1777. This work was supplemented by his experiences of foreign prisons (1778-1783). In 1789 he published an *Account of the Principal Lazarettos in Europe,* with notes on Continental and British prisons and hospitals. In the same year he made a final journey through Germany and Russia, when prisons and hospitals were everywhere thrown open for his inspection as a friendly monitor and public benefactor. He died of fever at Cherson in South Russia.

Howard, Oliver Otis, soldier, born at Leeds, Maine, in 1830; died in 1909. He graduated at West Point, served in the Seminole war and through the Civil war, being made major-general of volunteers in 1862, commander of the Department of Tennessee in 1864, brigadier-general in the regular army in 1864, and major-general in 1886. He was commissioner of the Freedman's Bureau 1865-74, and Peace Commissioner to the Indians of Arizona and New Mexico in 1872. He retired in 1894.

Howard University, an institution established at Washington, D. C., in 1867, by Gen. Oliver O. Howard, while in charge of the Freedman's Bureau, for the liberal education of freedmen. As now conducted pupils are admitted without distinction of sex or color. In addition to the college course, there are courses in medicine, dentistry, pharmacy, law, theology and normal instruction. It has 105 instructors, 1200 students, a library of 30,000 volumes and an endowment of about $280,000.

Howe, Edgar Ward, novelist, born near Huntington, Iowa, in 1854. His chief works are *A Story of a Country Town, The Mystery of the Locks, Confession of John Whitlock,* etc. Editor and publisher of the *Atchison Daily Globe.*

Howe, Elias, an eminent inventor, was born at Spencer, Massachusetts, in 1819; died in 1867. After long experiment he succeeded in 1846 in perfecting a sewing machine, the first satisfactory one ever invented and the basis of all those that have followed. He was for several years involved in expensive and harassing lawsuits to establish his right to reap the benefits of his own ingenuity, but obtained a verdict in his favor in 1854, and subsequently grew wealthy from the royalties paid on his patent. He equipped a regiment at his own expense in the Civil war, and served in it as a private. Immense numbers of the Howe sewing machines are now manufactured and sold in America, Great Britain, and elsewhere.

Howe, Julia Ward, author and poet, was born in New York city

in 1819. She received a careful education, and at an early age wrote plays and poems. She was married to Dr. Samuel G. Howe, philanthropist, in 1843. She afterward continued her studies, writing philosophical essays. In 1861 she composed the popular *Battle Hymn of the Republic*, the favorite lyric of the Civil war. She died in 1910 at the advanced age of 91.

Howe, RICHARD, EARL (1726-99), an English admiral. He was made vice-admiral in 1775 and appointed commander-in-chief in America February, 1776. He conducted the English naval operations in the Revolution.

Howe, WILLIAM, 5TH VISCOUNT (1729-1814), an English general; younger brother of George Augustus, 3d Viscount, killed in the Ticonderoga expedition of 1758, and of Richard, 4th Viscount, later Earl Howe, the admiral. Sent to America in 1758 he took part in the capture of Louisburg and accompanied Wolfe on his expedition to Quebec. In the Revolutionary war he commanded the British at Bunker Hill June 17, 1776, and in October became commander-in-chief, succeeding Gen. Gage. He won the battles of Long Island (1776), White Plains (1776), Brandywine (1777), and Germantown (1777). He was succeeded by Sir Henry Clinton (q. v.). See also *Burgoyne.*

Howells (how'elz), WILLIAM DEAN, novelist, was born at Martinsville, Ohio, in 1837. He learned the printer's trade with his father; was afterwards assistant editor on the *Ohio State Journal;* published a life of Abraham Lincoln and a volume of poems, and was appointed in 1861 consul at Venice. On his return to America in 1865 he joined the staff of the *Nation*, became afterwards editor of the *Atlantic Monthly* (1871-81), was editorial contributor to *Harper's Magazine*, 1886-91; editor for a time of the *Cosmopolitan*, and subsequently editor of the *Easy Chair of Harper's.* He became widely known as a writer of realistic novels. Among his many works are *Venetian Life* (1866), *Italian Journeys* (1867), *A Chance Acquaintance* (1873), *The Lady of the Aroostook* (1879), *A Modern Instance* (1883), *The Rise of Silas Lapham* (1885), *Literature and Life* (1902), *London Films* (1905), *Years of My Youth* (1915), etc. He died May 11, 1920.

Howitt (how'it), MARY, an English writer, born in 1805, the daughter of Mr. Botham, a Quaker; was married in 1823 to Mr. William Howitt (see next article). Mary Howitt wrote a number of hymns and ballads, several volumes in prose and verse for children, and translated Miss Bremer's works and H. C. Andersen's *Improvisatore.* Among her writings for the young may be mentioned *The Children's Year, The Dial of Love, A Treasury of Tales for the Young,* etc. In conjunction with her husband she also wrote *The Literature and Romance of Northern Europe* and *Ruined Abbeys of Great Britain.* She died in 1888.

Howitt, WILLIAM, born in 1792 of a Quaker family; began early to publish verses, and in conjunction with his wife (see above article) published shortly after their marriage a volume of poems—*The Forest Minstrel* (1823). In 1831 appeared his *Book of the Seasons*, in 1834 his *History of Priestcraft*, and in 1838 his popular *Rural Life in England.* In 1840 the Howitts settled at Heidelberg, and devoted themselves to introducing the literature of the north, especially of Sweden, to English readers. *Student Life in Germany* appeared in 1841, *Rural and Domestic Life in Germany* in 1842. In 1847 Mr. Howitt published his *Homes and Haunts of the British Poets*, and, after a visit to Australia, his *Land, Labor and Gold;* and *The History of Discovery in Australia.* In later life Mr. Howitt and his wife became spiritualists. He died in 1879.

Howitzer (hou'it-ser), a piece of ordnance having, as compared with a gun, a short barrel and curved trajectory. Its effect is produced chiefly by the explosion of the charge contained in the projectile. Among the various types of howitzers used in the Great war, 1914-18, were the German 11-inch, the British 8-inch and 9.2 inch, and the celebrated 155-millimeter French howitzer. The last named was one of the two most-used and best-known weapons of the Allies, the other being the French 75-millimeter field gun. Prior to 1917 it was built only in the factory of its original designer, the great firm of Schneider et Cie., in France. Later the United States took up the building of this howitzer and by the time the armistice was signed was turning out 12 of them every day. The howitzers of the United States Army include the 3.8-inch, the 4.7-inch, and the 6-inch, besides the 3-inch mountain howitzer carried on pack mules. America had under construction a 16-inch howitzer, with a barrel 26 feet 6 inches long, when the war ended.

Howler Monkey (*Mycētes*), a genus of South American monkeys, characterized by a remarkable loudness of voice, which is due to the presence of a large chamber within the hyoid bone and the enlarge-

ment of the ventricles of the larynx. In the tropical forests of America their hideous howls, probably a kind of amorous concert, may be heard during the night more than a mile away. They are prehensile-tailed, large and heavy of body, with a high pyramidal head flattened on the summit.

Howrah (hou'rä), a town of India, on the right bank of the Hugli, opposite Calcutta, of which it is practically a suburb, and with which it communicates by a floating bridge. It has large dockyards, jute and saw mills, and various manufactories. Pop. 157,-594.

Höxter (heuk'stèr), a town of Westphalia, Prussia, on the left bank of the Weser, once a Hanse town. Pop. 7699.

Hoy (hoi), a small vessel, usually rigged as a sloop, and employed in carrying goods and passengers short distances coastwise, and sometimes in conveying goods to and from larger vessels and the shore.

Hoy, an island of the Orkneys, Scotland, 3½ miles S. of Stromness. It is about 13 miles long and 6 broad; mountainous and healthy, but with fertile tracts. It has an excellent harbor, Long Hope. At the southwest of the island there is a detached pillar of rock 450 feet high, known as the Old Man of Hoy. Pop. 1380.

Hoya (hō'ya) a genus of Asclepiadaceæ, common in tropical Asia, and cultivated in hothouses on account of their ornamental appearance.

Hubbard, Elbert, author and publisher, born at Bloomington, Illinois, in 1859. He founded at East Aurora, New York, the famous Roycroft shop, devoted to making de luxe editions of the classics. He was editor of the *Philistine* and the *Fra*, radical and free-spoken journals. He also wrote *No Enemy but Himself, Little Journeys to the Homes of Famous Women*, etc. He was drowned at the sinking of the Cunard line steamship *Lusitania*, which was torpedoed by a German submarine off the coast of Ireland, May 7, 1915.

Huanuco Bark, the gray or silver cinchona bark imported in the form of quills from around Huanuco in Peru. It is the produce of *Cinchona micrantha*.

Hubble-bubble. See *Narghile*.

Huber (hō'ber), François, a Swiss naturalist, born in 1750; died in 1831. Notwithstanding the loss of his eyesight, he was able, by the help of his wife and his reader and amanuensis, to make observations and deductions which constitute decidedly the most important contribution by any one man to our knowledge of bees. His first work was published in 1792 under the title of *Lettres à Ch. Bonnet.* Four years after his *Nouvelles Observations sur les Abeilles*, practically a new edition, enlarged and amended of the other, appeared. His son Pierre also assisted his father, and himself published important observations on ants.

Hubert (hō'bert), St., the patron of huntsmen. He was of a noble family of Aquitaine. While hunting in the forests of Ardennes he had a vision of a stag with a shining crucifix between its antlers, and heard a warning voice. He was converted, entered the church, and eventually became Bishop of Maestrich and Liége. He worked many miracles, and is said to have died in 727 or 730.

Hubertsburg (hō'bertz-burg), formerly a hunting seat of the electors of Saxony, in the Leipzig district, now enlarged and divided into portions, used respectively as a public prison, a hospital, a lunatic asylum, etc. Here the Peace of Hubertsburg, which put an end to the Seven Years' war, was signed February 15, 1763.

Huc (ük), Evariste Regis, a French missionary and traveler, born in 1813. After studying theology, about 1837 he entered the order of the Lazarist Fathers, was ordained in 1838; in 1839 went to China as a missionary, and in company with Père Gabet made a journey of exploration in the interior of the empire and of Tibet. After this he returned in broken health to France, where he published *Travels in Tartary, Tibet and China*, a work which attained a wide popularity. He afterward published *The Chinese Empire* and *Christianity in China*. He died in 1860.

Huckleberry (huk'l-ber-i), an American name for the whortleberry (which see).

Huddersfield (hud'erz-fēld), a flourishing manufacturing town, in the West Riding of Yorkshire, England, 16½ miles southwest of Leeds. Among its institutions are two colleges for higher education, a technical school, etc. The town is the chief center of the fancy woolen trade. Broadcloths, doeskins, trouserings are also manufactured, and there are manufactories of steam engines, etc. Pop. 107,825.

Hudson (hud'sun), a town of Middlesex county, Massachusetts, 28 miles W. of Boston. It has manufactures of leather, rubber shoes,

elastic webbing, rubber clothing, paper and wooden boxes, etc. Pop. (1920) 7607.

Hudson, a city, county seat of Columbia Co., New York, finely situated on the Hudson River, 28 miles S. of Albany. Henry Hudson (q. v.) landed at the spot which is now the city of Hudson from his ship, the *Half Moon*, in 1609. It was settled by Nantucket whalers in 1785 and was once a prominent whaling port. It has large cement plants, textile mills, car-wheel works, brick and lumber plants, conveyor and ice-tool concern, etc. Pop. (1920) 11,745.

Hudson, HENRY, an English navigator, date of birth unknown. He sailed from London in the year 1607 in a small vessel, with only ten men and a boy, to discover the Northeast Passage, and proceeded beyond the 80th degree of latitude. In a second voyage he landed at Nova Zembla, but could get no further eastward. In 1609 he sailed from Amsterdam in the *Half Moon*, a vessel of about 80 tons, in the service of the Dutch East India Company, and discovered the Hudson River, which he ascended to the present site of Albany. He spent a month exploring the river and then returned to Europe. In 1610 he set out on another voyage in a ship called *Discovery* and reached Hudson Bay and Hudson Strait, where he wintered; but his crew mutinied after suffering many hardships, and set him adrift in a boat along with his son John and seven of the crew, none of whom was ever heard of again.

Hudson Bay, or HUDSON'S BAY, an extensive bay, or rather an inland sea, Dominion of Canada, extending between lat. 51° and 64° N., and lon. 77° and 95° W.; length, north to south, about 800 miles; greatest breadth, about 600 miles. Hudson Bay is open to navigation for 4½ months in summer (from middle of June to end of October), but is obstructed by drift-ice during the rest of the year. There are many islands, reefs and sand-banks. The shores on the east are high and bold; but those on the west especially towards the south, are low and level. The white whale is found in its waters, and there is a considerable summer fishery.

Hudson Bay Company, an English trading company, chartered by Charles II, May 2, 1670. It had long a monopoly of the trade throughout the whole territory of North America whose streams flow into Hudson Bay, and at one time as far westward as the Pacific, with rights of governing and making war. In 1870 its authority was transferred by act of Parliament to the crown, and its territories incorporated in the Dominion of Canada. Its trade in furs is still very large. See *Fur Trade*.

Hudson Falls, a village, county seat of Washington Co., New York, on Hudson River, 50 miles N. E. of Albany. It has foundries, wall paper mills, planing mills, etc. There is water power. Pop. (1920) 5761.

Hudson River, a river on the Atlantic coast of the United States. It rises, by two branches, in the northern part of the State of New York, in the Adirondack Mountains, about lat. 44° N. Two small streams unite to form the river, which is afterwards joined by the Schroon and Sacondaga. At Glen's Falls it has a fall of 50 feet, after which it runs almost due south to its mouth in New York Bay. Its whole course is over 300 miles; it is navigable as far as Albany, 145 miles, for the largest vessels. The banks of the Upper Hudson are high and rocky; and the scenery very picturesque. It was discovered in 1609 by Henry Hudson, after whom it was named.

Hué (hö-ā'), the capital city of Anam, on the river Hué, which is here navigable for small craft, 10 miles from its mouth in the Gulf of Tonquin. It was fortified in the present century in European style by French officers in the service of the king of Cochin-China. The circumference of the walls is upwards of 5 miles. The city has a considerable trade. Pop. (1911) 61,600.

Hue and Cry, in English law, the pursuit of a felon or offender, with loud outcries or clamor to give an alarm. This procedure is taken by a person robbed, or otherwise injured, to pursue and get possession of the culprit's person. At common law, a private person who has been robbed, or who knows that felony is committed, is bound to raise hue and cry under pain of fine and imprisonment. This is generally done by informing the nearest constable; and this process is still recognized by the law of England as a means of arresting felons without the warrant of a justice of the peace. The same name is also applied to a paper circulated by the secretary of state for the home department announcing the perpetration of offenses.

Huelva (u-el'vȧ), a seaport town of Southwestern Spain, capital of the province of same name in Andalusia. It has wide and well-built streets. There are manufactures of matting, ropes, sails, etc., a large trade in the exportation of copper ore; also in fruits and wine. The fisheries, mainly sardine and tunny, are

of considerable value. Pop. 21,357.—The province of Huelva is mountainous and well wooded in the north, and contains celebrated copper mines. In the south it is comparatively level, and has a rich alluvial soil. Pop. 260,880.

Huerta (hwār-ta), Victoriano, Provisional President of Mexico after the death of President Madero, was born, of Indian descent, in 1854, and graduated in 1876 from the Military College of Chapultepec. His first service in the field was in 1901, when as a colonel he took part in the campaign against the insurgent Yaquis, and afterwards against the Mayas. His life, however, was chiefly passed in scientific work for the army until 1910, when, as a brigadier general, he took part in the field in the service of President Diaz against the Madero revolutionists. He commanded the guard that accompanied Diaz to Vera Cruz after his resignation, and subsequently served under President Madero, taking an active part in the uprisings of 1912 and 1913; but on February 18, 1913, turned traitor to Madero, seized and imprisoned him, and was proclaimed Provisional President by his fellow conspirators. The subsequent assassination of Madero was widely believed to be due to the instigation of Huerta. He was never recognized as president by the United States and was forced to resign in July, 1914. He was imprisoned in El Paso, Texas, in 1915, charged with conspiracy to violate the neutrality laws of the United States, and died there Jan. 13, 1916.

Huet (ù-ā), Pierre Daniel, a French critic and classical scholar, born at Caen, Normandy, in 1630; died in Paris, 1721.

Huggins (hug'inz), Sir William (1824-1919), an eminent English astronomer, born in London. He gained distinction by his discoveries with the spectroscope on the sun and stars. He was president of the Royal Astronomical Society 1876-78, and of the British Association 1891-92.

Hughes (hūz), Charles Evans, an American jurist, public official and cabinet officer, born at Glens Falls, New York, in 1862. He was graduated from Brown University and Columbia Law School, was professor of law at Cornell University 1891-93, lecturer 1893-95, and at New York Law School after 1893. In 1905 he became counsel on the Armstrong investigations of life insurance companies, and developed very serious evils in the conduct of these institutions. His excellent work in this investigation led to his election as governor of New York in 1906, and again in 1908 In 1910 he was appointed associate of the United States Supreme Court. He resigned in 1916 to become the candidate for President on the Republican ticket. In 1921 he became secretary of state in President Harding's cabinet.

Hughes, John, archbishop, was born in County Tyrone, Ireland, in 1798. He came to the United States in 1817 and was ordained priest in 1826. In 1838 he became coadjutor bishop of New York, bishop in 1847, and its first archbishop in 1850. In 1861 he was entrusted by President Lincoln with a special mission to France in behalf of the Union cause. He was the founder of St. John's College, Fordham, and of St. Patrick's Cathedral. He died in 1864.

Hughes, Rupert, an American author, born in 1872 at Lancaster, Mo., graduated from Adalbert College, 1892; A.M., Yale, 1899. Author of *Excuse Me, What Will People Say? The Thirteenth Commandment*, etc.

Hughes, Sir Samuel (1853-1921), a Canadian army officer, born at Darlington, Ontario, son of John Hughes, of Tyrone, Ireland, and Caroline Laughlin, of Scotch-Irish-Huguenot descent, educated at Toronto Model and Normal schools and Toronto University. He was lecturer in English in Toronto Collegiate Institute until 1885, when he purchased the Lindsay *Warder*, which he edited until 1897, and was in the Active Militia from his thirteenth year; in 1897 he became lieutenant-colonel in command of the 45th battalion. He visited Australia and New Zealand in 1897-98 in the interest of Colonial assistance in imperial wars; served in the Boer war, 1899-1900, being mentioned in dispatches several times; served in the European war in France, 1914-15, built the cantonment at Valcartier (see *Canada*), and as Minister of Militia and Defense in the Borden cabinet raised contingents for the European war, 1914-18. He became colonel in 1902 and was promoted to major-general in 1914; knighted in 1915.

Hughes, Thomas (1822-96), an English barrister, author and philosopher, born at Uffington, Berkshire. He was educated at Rugby under Dr. Arnold, and afterwards at Oxford. In 1848 he was called to the bar, and in 1869 became a queen's counsel. He is widely known by his popular novel, *Tom Brown's School Days*, a picture of school life at Rugby, published in 1856. *Tom Brown at Oxford* followed in 1861.

Hugli, or Hoogly, a city and river port of Bengal, British India. The chief industries are jute bags and oil. Pop. 29,000.

Hugli, or Hooghly (hög'lĭ), an arm of the Ganges, at the Delta.

Hugo (ü-gō), Victor Marie, a French poet and novelist, born in 1802, at Besançon, where his father, then Major Hugo, was stationed in command of a brigade. His father having entered the service of Joseph Bonaparte, king of Italy, and afterwards of Spain, Victor's earlier years were partly spent in those countries, but in 1812 he went with his

Victor Hugo

mother to Paris. At the age of twelve he was already writing verses, and in 1823 his first novel, *Han d'Islande*, appeared, followed in 1825 by *Bug Jargal*. In 1828 a complete edition of his *Odes et Ballades* appeared. In these productions Hugo's anticlassical tendencies in style and treatment of his subject had been very visible, but the appearance of his drama *Cromwell* (1827), with its celebrated preface, gave the watchword to the anticlassical or romantic school. *Cromwell* was too long for representation, and it was only in 1830 that *Hernani*, over which the great contest between Classicists and Romanticists took place, was brought on the stage. Other dramas followed:—*Marion Delorme* (1831), *Le Roi s'amuse* (1832), *Lucrèce Borgia* (1833), *Marie Tudor* (1833), *Angelo* (1835), *Ruy Blas* (1838), *Les Bourgraves* (1843). During those years he had also published a novel, *Nôtre Dame de Paris* (1830), and several volumes of poetry, *Les Feuilles d'Automne* (1831), *Les Chants du Crépuscule* (1835), *Les Voix Intérieures* (1837), *Les Rayons et Les Ombres* (1840). His poetry of this period has a melody of grace superior perhaps to any that he afterwards wrote, but wants that deep and original sense of life which is characteristic of his later poems. During the same period he also wrote his critical essays on Mirabeau, Voltaire, and a number of articles for the *Revue de Paris*. In 1841, after having been twice previously rejected, he was elected a member of the French Academy; made shortly afterwards a tour in the Rhineland, of which he wrote a brilliant and interesting account in *Le Rhin*, published in 1842. In 1845 he was made a peer of France by Louis Philippe. The revolution of 1848 threw Hugo into the thick of the political struggle. At first his votes were decidedly Conservative, but afterwards, whether from suspicion of Napoleon's designs or from other reasons, he became one of the chiefs of the democratic party. After the *coup d'état*, December 2, 1851, he was one of those who kept up the struggle in the streets against Napoleon to the last. He then fled to Brussels, where he published the first of his bitter satires on the founder of the Second Empire, *Napoléon le Petit*. In the following year (1853) the second, the famous volume of *Les Châtiments*, a wonderful mixture of satirical invective, lyrical passion and pathos appeared. Hugo now went to live in Jersey, was expelled along with the other French exiles in 1855 by the English government, and finally settled in Guernsey. It was in the comparative solitude and quietness of the Channel Islands that he wrote most of the great works of his later years. *Les Contemplations* (1856), *La Légende des Siècles*, 1st series (1859), *Chansons des Rues et des Bois* (1865), and his celebrated series of social novels, *Les Misérables* (1862), *Les Travailleurs de la Mer* (1866), and *L'Homme qui Rit* (1869). In 1870, after the fall of the Empire, Victor Hugo returned to Paris, where he spent the remaining years of a remarkably vigorous old age in occasional attendances at the senate, and in adding to the already long list of his literary works. Among these latest productions we may mention *Quatre-vingt-treize* and the drama *Torquemada*. He died in 1885.

Hugo, a city, county seat of Choctaw Co., Oklahoma, 125 miles N. E. of Dallas, Texas, on the Kiamichi River. Farming, stock raising, trucking and fruit growing are the chief industries. Pop. 6368.

Huguenots (hü'ge-nots), a term of unknown origin, applied by the Roman Catholics to the Protestants of France during the religious struggles of the sixteenth and seventeenth centu-

ries. During the early part of the sixteenth century the doctrines of Calvin, notwithstanding the opposition of Francis I, spread widely in France. Under his successor, Henry II, 1547-59, the Protestant party grew strong, and under Francis II became a political force headed by the Bourbon family, especially the King of Navarre and the Prince of Condé. At the head of the Catholic party stood the Guises, and through their influence with the weak, young king, a very long conflict with the Huguenots commenced. The result was that a Huguenot conspiracy, headed by Prince Louis of Condé, was formed for the purpose of compelling the king to dismiss the Guises and accept the Prince of Condé as regent of the realm. But the plot was betrayed, and many of the Huguenots were executed or imprisoned. In 1560 Francis died, and during the minority of the next king, Charles IX, it was the policy of the queen mother, Catharine de Medici, to encourage the Protestants in the free exercise of their religion in order to curb the Guises. But in 1562 an attack on a Protestant meeting made by the followers of the Duke of Guise gave rise to a series of religious wars which desolated France almost to the end of the century. Catharine, however, began to fear that Protestantism might become a permanent power in the country, and, making an alliance with the Guises, she suddenly projected and carried out the massacre of St. Bartholomew's (August 24, 1572). The Protestants fled to their fortified towns and carried on a war with varying success. On the death of Charles IX, Henry III, a feeble sovereign, found himself compelled to unite with the King of Navarre, head of the house of Bourbon and heir-apparent of the French crown, against the ambitious Guises, who openly aimed at the throne, and had excited the people against him to such a degree that he was on the point of losing the crown. After the assassination of Henry III, the King of Navarre was obliged to maintain a severe struggle for the vacant throne; and not until he had, by the advice of Sully, embraced the Catholic religion (1593), did he enjoy quiet possession of the kingdom as Henry IV. Five years afterwards he secured to the Huguenots their civil rights by the Edict of Nantes, which confirmed to them the free exercise of their religion, and gave them equal claims with the Catholics to all offices and dignities. They were also left in possession of the fortresses which had been ceded to them for their security. This edict afforded them the means of forming a kind of republic within the kingdom, which Richelieu, who regarded it as a serious obstacle to the growth of the royal power, resolved to crush. The war raged from 1624 to 1629, when Rochelle, after an obstinate defense, fell before the royal troops; the Huguenots had to surrender all their strongholds, although they were still allowed freedom of conscience under the ministries of Richelieu and Mazarin. But when Louis XIV and Madame de Maintenon set the fashion of devoutness, a new persecution of the Protestants commenced. They were deprived of their civil rights, and bodies of dragoons were sent to the southern provinces to compel the Protestant inhabitants to abjure their faith. The Edict of Nantes was revoked in 1685, and by this act more than 500,000 Protestant subjects were driven out, to carry their industry, wealth, and skill to other countries. In the reign of Louis XV a new edict was issued repressive of Protestantism, but so many voices were raised in favor of toleration that it had to be revoked. Louis XVI, in 1787, first put the Protestants on an equality with the Catholics.

Huia-bird (hwē'a-berd), the native name of a genus of New Zealand starlings, *Heteralocha acutirostris* or *Neomorpha Gouldii*, comprising a single species of birds, occupying a very limited space in a few densely-wooded mountain ranges. The plumage is a very dark green, appearing to be black in some lights, the tip of the tail white. The most striking peculiarity about this bird is that the male has a stout, straight beak; the female a long, slender, curved bill.

Hulk, the name applied to old ships laid by as unfit for further sea-going service, and used as depots for coals, sailors, etc.

Hull, ISAAC, naval officer, born at Derby, Connecticut, in 1775; died in 1843. He became a naval officer in the United States service. In July, 1812, he escaped by skilful sailing with the frigate *Constitution* from a three days' chase by a British squadron, and on August 19 met and sunk the British frigate *Guerriere*, after half an hour's fight, with very little loss to his ship or men.

Hull, WILLIAM, military officer, was born in Derby, Connecticut, in 1753; was governor of Michigan Territory 1801-14, and in 1812 commanded the Northwest army and surrendered Detroit to General Brock without firing a shot. He was court-martialed and sentenced to be shot, but was pardoned on account of his services in the Revolution. He died in 1825.

Hull, a city, capital of Ottawa county, Quebec, Canada, on the Ottawa River, opposite Ottawa city. It has pulp, paper, lumber and other mills, and in the vicinity are iron, phosphate and mica mines. Pop. (1913) 22,000.

Hull, or KINGSTON-ON-HULL, a river port of England, and a county of itself, locally situated in the East Riding of York at the influx of the Hull into the estuary of the Humber. The town stands on a low and level tract of ground, and stretches along the banks of the Humber, from the inundations of which it is secured by strong embankments. Among the notable public buildings and institutions are the town hall, the new exchange, the corn exchange, dock offices, etc., the royal institution, the public rooms, Hull and East Riding College, Reckitt free library, the infirmary, dispensary, children's hospital, etc. There are three well-laid-out public parks. The industries of the town are varied, comprising flax and cotton mills, shipbuilding, rope and sail works, iron foundries, machine-making, seed-crushing, color-making, oil-boiling, etc.: but its importance arises chiefly from its shipping commerce, Hull being one of the busiest seaports in the kingdom. The docks are among the largest in the kingdom. The railway communications are excellent, not fewer than five railway companies running into the town. It is an ancient town, and was of some importance long before it received its charter from Edward I. It played a conspicuous part during the civil war, being held by the parliamentary forces, and twice besieged without success. Pop. (1911) 278,024.

Hullah (hul'la) JOHN PYKE, an English musician, born in 1813; died in 1884. He entered the Royal Academy of Music in 1832, and attracted some attention by his comic opera, *The Village Coquettes* (1836), which was followed by the *Barber of Bassora* in 1837, and *The Outpost* in 1838. About this time he began to work for the establishment of popular singing schools. He became professor of music at King's College and other institutions in London, and in 1874 inspector of training schools. He wrote some educational and historical works on music, among which are the *Grammar of Harmony, Grammar of Counterpoint, A History of Modern Music*, etc.

Humanists (hū'man-ists), a party which, during the Renaissance of the sixteenth century, cultivated literature, especially classical literature. Their influence was decidedly in favor of progress and reform, and in this way they may be considered as heralding and coöperating with the great religious reformers. Erasmus is the great type of the humanist, as Luther is of the religious reformer.

Humanitarians (hū-man-i-tā'ri-anz), a term sometimes applied to the various classes of anti-Trinitarians, who regard Christ as a mere man. Their opinions must not be confounded with Arianism, which admits the preëxistence of Christ, and his preëminence among God's creatures. The term is also applied to the followers of St. Simon, who maintain d the perfectibility of human nature without the aid of supernatural grace.

Humanities (hū-man'i-tēz; Latin, *litoræ humaniores*), a term for humble or polite literature, including the study of the ancient classics, in opposition to philosophy and science. In the Scotch universities *humanity* is applied to the study of the Latin language and literature alone.

Humber (hum'bėr), a large river, or rather estuary, on the east side of England, between the counties of York and Lincoln. At its western extremity it is joined by the Ouse, after the latter has been augmented by the Derwent and Aire; below Goole it receives the Don, lower down the Trent, and still lower the Hull from the opposite side. It is about 35 miles long, and varies in breadth from 1 to 7 miles. There is at all times a considerable depth of water in the fair way of the channel, and the navigation is safe and easy.

Humbert I (in Italian, UMBERTO), King of Italy, was born March 14, 1844, eldest son of Victor Emmanuel. In the war of 1866, in which Italy joined Prussia against Austria, he took the field in command of a division, and distinguished himself by his bravery in the disastrous battle of Custozza. In 1868 he married his cousin, Margherita, daughter of Duke Ferdinand of Genoa. He succeeded his father on January 9, 1878. He was assassinated by a pistol shot, July 29, 1900, by Gaetang Bresci, an Italian anarchist, and was succeeded by his son, Victor Emmanuel III.

Humboldt (hum'bolt), FRIEDRICH HEINRICH ALEXANDER, BARON VON, a German traveler and naturalist, was born in 1769, at Berlin, where his father held the post of royal chamberlain. He studied at the universities of Frankfort-on-the-Oder, Berlin and Göttingen, and also at the commercial academy in Hamburg. His first work was *Observations on the Basalt of the Rhine* (1790). In 1791 he studied min-

ing and botany at the mining school in Freiberg, and subsequently became overseer of the mines in Franconia. In 1797 he resolved to make a scientific journey in the tropical zones along with a friend, Aimé Bonpland. They landed at Cumana, in South America, in July, 1799, and spent five years in exploring scientifically the region of the Orinoco and the upper part of the Rio Negro, the district between Quito and Lima, the city of Mexico and the surrounding country, and the island of Cuba. In 1804 they arrived at Bordeaux, bringing with them an immense mass of fresh knowledge in geography, geology, climatology, meteorology, botany, zoölogy, and every branch of natural science, as well as in ethnology and political statistics. Humboldt selected Paris as his residence, no other city offering so many aids to scientific study, and remained there arranging his collections and manuscripts till March, 1805, after which he visited Rome and Naples in company with Gay-Lussac, but eventually returned to Paris in 1807, when the first volume of his great work, *Voyage aux Régions équinoxiales du Nouveau Continent*, appeared; the thirtieth and last was published in 1827. In 1827 Humboldt, who had been offered several high posts by the government of Prussia, and had accompanied the king on several journeys as part of his suite, was persuaded to give up his residence at Paris and settle at Berlin, where he combined the study of science with a certain amount of diplomatic work. In 1829, under the patronage of the Czar Nicholas, he made an expedition to Siberia and Central Asia, which resulted in some valuable discoveries, published in his *Asie Centrale*. In 1835 he published at Paris his *Examen Critique de la Géographie du Nouveau Continent*. In 1845 appeared the first volume of the *Cosmos*, his chief work, a vast and comprehensive survey of natural phenomena, in which the idea of the unity of the forces which move below the variety of nature is thoroughly grasped. Humboldt died in 1859.

Humboldt, KARL WILHELM, BARON VON, brother of the preceding, was born at Potsdam in 1767, and studied at Berlin, at Frankfort-on-the-Oder, and at Göttingen. After traveling in France and Spain, and acting as Prussian minister at Rome, he was called to fill the office of minister of the interior in connection with ecclesiastical and educational matters, and had a most important share in the educational progress which Prussia has since made. In 1810 he became minister plenipotentiary to Vienna, took an active part in the conclusion of the Peace of Paris (1814), and at the Congress of Vienna (1815), and other great diplomatic transactions. In 1819 he was an active member of the Prussian ministry, but resigned and retired to his estate at Tegel, where he died in 1835. His works include poems, literary essays, etc., but by far the most valuable are his philological writings, such as *Additions and Corrections* to Adelung's *Mithridates; Researches Regarding the Original Inhabitants of Spain in Connection with the Basque Language;* on the *Kawi Language of Java;* on the *Diversity of Language and its Influence on the Development of Speech;* etc.

Hume (hūm), DAVID, an eminent historian and philosopher, was born at Edinburgh in 1711. He was

David Hume

destined for the law but took up literature and retired to France where he composed his *Treatise upon Human Nature*. The work was published at London in 1738, but in his own words, 'fell dead-born of the press.' His next work, *Essays, Moral, Political and Literary* (Edinburgh, 1742), met with a better reception. In 1745 he became companion to the insane Marquis of Annandale; and he accompanied General Sinclair in 1746 and 1747 in his expedition against France and in a military embassy to Vienna and Turin. He now published a recasting of his *Treatise upon Human Nature*, under the title of an *Inquiry Concerning the Human Understanding* (1747). In 1752 he published his *Political Discourses*, which were well received.

and his *Inquiry Concerning the Principles of Morals*. The same year he obtained the appointment of librarian of the Advocates' Library at Edinburgh, and began to write his history of England, of which the first volume appeared in 1754. It was, like most of the succeeding volumes, severely attacked both for its religious and political tendencies; but, in spite of adverse criticism, his *History of England*, after its completion in 1761, was recognized as a standard work. Its merits are chiefly clearness and force of narrative and philosophical breadth of view in the judgment of men and events. In 1763 he accepted an invitation from the Earl of Hertford, then proceeding as ambassador to Paris, to accompany him, and was enthusiastically received by Parisian circles in his character of philosopher and historian. After the departure of Lord Hertford in 1766, he remained as *chargé d'affaires*, and returned to England in 1766, bringing with him Rousseau, for whom he procured a pension and a retreat in Derbyshire. But the morbid sensitivity of Rousseau brought about a disagreement which put an end to the friendship. In 1767 he was appointed under-secretary of state, a post which he held till 1769, when he retired to Edinburgh. Here he lived till his death in 1776. As a philosopher, in which quality his reputation is perhaps greatest, Hume's acute sceptical intellect did great service by directing research to the precise character of the fundamental conceptions in which our knowledge and our beliefs are based. His acute negative criticism of these conceptions (*e. g.*, his reduction of the ideas of personal identity, conscience, casuality, to mere effects of association) compelled philosophy either to come to a dead halt or to find, as Kant did, a new and profounder view of the nature of human reason.

Hume, JOSEPH, politician and economist, born at Montrose, Scotland, in 1777. After studying medicine at Edinburgh he was appointed marine assistant-surgeon in the service of the East India Company. He held several lucrative posts, returned to England in 1808 with a fortune, and entered Parliament in 1812, where for many years he was notable as a financial reformer, and an opponent of monopolies and high taxes. He died in 1855.

Humerus (hū'mėr-us), the long cylindrical bone of the arm, situated between the shoulder and the forearm; also the corresponding bone in the lower animals.

Humidity (hū-mid'i-ti), in meteorology, the amount of moisture in the atmosphere. A given space can only contain one certain amount of water; containing less it will fill up with evaporation, if more by condensation. When it contains all the moisture it is capable of holding, it is said to be saturated. If the air contains one-half of the water necessary to saturate it the relative humidity is 50; 100 being the point of saturation, after which precipitation ensues.

Humming-birds, the name given to a family (Trochilidæ) of minute and beautiful birds, so called from the sound of their wings in flight. The beak is slender, generally long, sometimes straight and sometimes curved; the tongue is long, filiform, bifid at the point, and capable of being protruded to a considerable distance. In size humming-birds vary from that of a wren to that of a bumble-bee. They never light to take food, but feed while on the wing, hovering before a flower, supported by a rapid vibratory movement of the wings which produces the humming noise. Insects form a great proportion of their food. These beautiful birds are peculiar to America, and almost exclusively tropical. One species, the ruby-throated humming-bird (*Trochilus colubris*), is somewhat common in the north-east of the United States. The only note of the humming-bird is a single chirp, not louder than that of a cricket. The family consists of about 600 species, all American, and mostly tropical.

Tufted-necked Humming-bird (*Ornismya ornāta*).

Humperdinck (hum'pėr-dinḳ), ENGELBERT, a German composer, born at Siegburg, in 1854. He studied at Cologne and Munich and later assisted Richard Wagner at Bayreuth, in the production of Parsifal in 1880-81. His fame mainly rests on his operas *Hansel and Gretel* and *Die Koenigskinder*. He visited the United States several times. Died September 28, 1921.

Humus (hū'mus), a substance which occurs in vegetable mold, and in liquids containing decomposing vegetable matter. Humus as it exists in the soil is a product of the decay of vegetables. It is a mixture of various carbon

compounds, which slowly undergo combustion with the production of carbon dioxide, water and ammonia, which are again taken up by plants.

Hundred, in England, a division of a shire or county. It was so called, according to some writers, because each hundred found 100 sureties of the king's peace, or 100 able-bodied men of war. Others think it to have been so called because originally composed of 100 families. Hundreds are said to have been first introduced into England by Alfred. Formerly if a crime was committed, such as robbery, arson, killing or maiming cattle, destroying turnpikes or works on navigable rivers, the hundred had to make it good; but hundreds are now only liable for damage done by rioters acting feloniously.

Hungary (hun'gȧ-ri; Hungarian name, *Magyar-Országg*, Land of the Magyars), formerly a kingdom, S. E. of Austria, in Austro-Hungarian monarchy. It included Hungary proper, with Transylvania, Slavonia, Croatia, the Croato-Slavonian Military Frontiers, etc.; total area, 125,039 sq. miles, with a pop. of 19,254,559. Hungary Proper (including Transylvania), area, 108,258 sq. miles, and a pop. of 16,721,574, may be considered as a large basin surrounded by mountains on every side except the south. Of these the principal are the Carpathians, which cover the northern and eastern parts of the country with their ramifications. The Danube and the Theiss, with their affluents, are the chief rivers. The Poprad, in the north, is tributary to the Vistula, being the only Hungarian river not belonging to the basin of the Danube. The Drave forms the southwest frontier on the side of Croatia and Slavonia. Between the Danube and the Drave lie the two principal lakes, the Platten See or Balaton Lake and the Neusiedler See, from which the water occasionally disappears. Hungary is one of the healthiest countries in Europe, and generally has a fertile soil. All kinds of grain, especially excellent wheat, wines, fruits, tobacco, hemp, flax, hops, saffron, woad, madder, sumach and cotton, are among the products of Hungary. Horses, cattle, sheep, hogs, game (in the north bears), poultry, fish, (especially the sturgeon and salmon), bees and silkworms are among the productions of the animal kingdom. Among the minerals are gold, silver, copper, iron, lead, zinc, cobalt, antimony, sulphur, arsenic, salt, etc., with coal and peat. The situation of Hungary, which occupies an area where the various races of Europe meet and interlace, accounts for the variety of nationalities it contains. These comprise, besides the Hungarians or Magyars (over 6,000,000 in number), Roumanians, Slovacks, Germans, Servians, Ruthenians, etc. The Magyars, who are the dominant race, are located for the most part compactly in the center of the kingdom. They are brave, high-spirited and sincere, in many respects resembling their kinsmen the Turks. A decided majority are Roman Catholics, the rest Protestants, chiefly Calvinists, with a few Greek Catholics. The Germans have settled all over the country, and there is scarcely a town of Hungary which is not at least partly inhabited by Germans, while some are essentially German. Science, literature, the press, trade and industry, are for the greater part in their hands. The Hungarian has a natural inclination to agriculture and the breeding of cattle, and the fertility of the soil making up for some deficiencies in methods has made Hungary one of the chief grain-growing countries of Europe. The Hungarian flour is of very fine quality, and is exported to a large value, while there are also extensive wheat exports. Hungary is also celebrated for its wines, the finest variety of which is the Tokay. There are few extensive manufactures. Iron and steel works, potteries, glass manufactories, sugar-refineries, soap and tallow works, are among the principal. The production of coal and iron is increasing and the annual value of the mining products is about $20,000,000. With regard to popular education Hungary is behind the Austrian part of the empire, but education was made compulsory in 1868. There are universities at Budapest, Klausenburg and Agram. The Hungarian language is nearly allied to the Turkish and Finnish, but not to any other tongue spoken in Europe. It has of late been carefully cultivated, and Hungarians have distinguished themselves in all branches of literature. Among modern names we can only mention those of Andrew Horváth, Eötvös, A. and C. Kisfaludy, Garay, Vörösmarty, Petöfi, Kerény, Arany, Josika and Jokay. Besides its representation in the controlling body of Delegations (see *Austria*) Hungary since 1867 has had an independent Diet, consisting of an Upper and Lower House, the first composed of hereditary and life peers, church dignitaries and state dignitaries; the second of representatives elected by vote. The Austrian emperor was also king of Hungary. Croatia and Slavonia (now in Jugo-Slavia) had a common diet of their own for the management of internal affairs.

History.—The Magyars, an Asiatic peo-

Hungary

ple of Turanian race, allied to the Finns and the Turks, dwelt in what is now Southern Russia before they descended under Arpâd into the plain of the Danube, towards the end of the ninth century, and conquered the whole of Hungary and Transylvania. During the first half of the tenth century their invasions and incursions spread terror throughout Germany, France and Italy, but at length their total defeat by Otho I of Germany put an end to their maraudings, and under their native dynasty of Arpâds they settled down to learn agriculture and the arts of peace. Stephen I (907-1030) was the first who was successful in extending Christianity generally amongst the Hungarians, and was rewarded by a crown from Pope Sylvester II and with the title of *apostolic king* (1000). Stephen encouraged learning and literature, and under him Latin became not only the official language of the government, but the vehicle of Hungarian civilization, which it unfortunately continued to be for the next 800 years. In 1089 King Ladislaus extended the boundaries of Hungary by the conquest of Croatia and Slavonia, and King Coloman by that of Dalmatia in 1102. During the twelfth century the Hungarians first attained, through French connections, a certain refinement of life and manners. About the middle of the thirteenth century King Bela induced many Germans to settle in the country which had been depopulated by the Mongol invasions. With Andrew III (1290-1301) the male line of the Arpâd dynasty became extinct, and the royal dignity now became purely elective. Charles Robert of Anjou was the first elected (1309). Louis I (1342-82) added Poland, Red Russia, Moldavia and a part of Servia, to his kingdom. The reign of Sigismund (1387-1437), who was elected Emperor of Germany, is interesting from the invasion of Hungary by the Turks (1391), and the war with the Hussites. Sigismund introduced various reforms, and founded an academy at Buda. Matthias Corvinus (1458-90), combining the talents of a diplomatist and general, was equally successful against his enemies at home and abroad, and is even yet remembered by the popular mind as the ideal of a just and firm ruler. He founded a university at Pressburg. During the reigns of Ladislaus II (1490-1516) and Louis II (1516-26) the rapacity of the magnates and domestic troubles brought the power of Hungary low, and the battle of Mohacs (1526) made a great part of the country a Turkish province for 160 years. The rest was left in dispute between Ferdinand of Austria and John Zapolya; but eventually by the help of the Protestants it passed to the former, and has since remained under the scepter of the Hapsburgs. In 1686 Leopold I took Buda and recovered most of Hungary and Transylvania. In 1724 Charles VI secured by the Pragmatic Sanction the Hungarian crown to the female descendants of the house of Hapsburg, and the loyalty of the Hungarians to his daughter, Maria Theresa, saved the dynasty from ruin. Maria Theresa did much for the improvement of Hungary by the promulgation of the rural code called Urbarium, and by the formation of village schools. On the advent of the French revolution, and during the wars which ensued, the Hungarians once more played a prominent part in support of the Hapsburg crown. Napoleon fell, but the revolution had given an impetus to ideas of national and popular rights which the Hungarians, long stifled under the Germanic traditions and tendencies of their rulers, were amongst the first to feel. For a time Francis I and Metternich stood stiffly out against all concessions, and tried to govern by pure absolutism, but ended by summoning in 1825 a new diet. The diet distinguished itself by adopting the Magyar language in its debates, instead of the Latin to which it had been accustomed. Succeeding diets in 1830 and 1832 made new demands in the direction of religious equality, a popular suffrage, and abrogation of the privileges of the nobles. The Austrian government attempted to repress the Hungarian national movement by imprisoning Deâk, Kossuth, and others of the leaders. The struggle continued till 1848, when the French revolution of that year gave the impulse for a similar rising in Vienna. Prince Metternich fled to London, and the Viennese court made a formal concession of all important demands but these had no sooner been granted than the government began secretly to work against their being put in operation. The dependencies of the Hungarian crown, the Croats and the Wallachians of Transylvania were privately encouraged to revolt, and in December of the same year an Austrian army took the field with the avowed object of annihilating the independence of Hungary; but a series of pitched battles resulted on the whole so much in favor of the Hungarians that Austria was obliged to call in the aid of Russia, which was at once granted. After a heroic struggle the Hungarians had to succumb. The nation was reduced to the position of a province, and some of the greatest statesmen and soldiers of Hun-

gary perished on the scaffold. But the struggle was continued by the Hungarians in the form of a constitutional agitation, and at last, when the battle of Sadowa in 1866 separated Austria from Germany, Austria, left face to face with a nation almost as powerful and numerous as itself, felt compelled to submit. In 1867 a separate constitution and administration for Hungary was decreed, and on June 8th Francis Joseph was crowned King of Hungary. The dualism of the Austro-Hungarian monarchy was thus finally constituted. Hungary made considerable progress in science and industry, and a program of electoral reform was being agitated when the European war broke out in 1914. The Hungarians espoused the Austrian cause. The defeat of the Central powers in 1918 led to the disruption of the Austro-Hungarian empire and Hungary was declared a republic November 17, 1918. Bela Kun attempted to set up a Bolshevik government but was overthrown with the help of the Roumanians. The Roumanian military forces occupied Budapest and remained in military occupation of the country for some time. Archduke Joseph became provisional president in August, 1919, but resigned because of the protests of the Allies. In November, 1919, a coalition cabinet was formed, headed by Karl Huszar.

The treaty of peace was signed at Versailles June 4, 1920. It amputated two-thirds of Hungary's territory, with all the mining, timber, and most of the manufacturing interests. Croatia and Slavonia were incorporated in the Serb-Croat-Slovene state, Jugo-Slavia; Transylvania was given to Roumania; and a large strip of territory in the north was divided between Czechoslovakia and Poland. The pop. of Hungary in 1921 was 7,840,832; area, 35,164 sq. miles. Ex-emperor Charles (Karl), who was exiled to Madeira, died there April 1, 1922. (See also *Austria-Hungary.*)

Hunger (hun'gĕr), a craving for food. It is a sensation partly arising in the stomach, since it may be relieved temporarily by the introduction into the stomach of material which is incapable of yielding any nutriment to the body. It may be due to a condition of fullness of the vessels of the stomach, relieved by any stimulus which, acting on the lining membrane, induces a flow of fluid from the glands. But it also arises from a condition of the system since the introduction of nutriment into the blood, apart altogether from the stomach, will relieve it. This is also evident from the fact that hunger may be experienced even when the stomach is full of food, and when food is supplied in abundance, if some disease prevents the absorption of the nourishment, or quickly drains it from the blood. Hunger may be partially allayed by sleep or by the use of narcotics, tobacco and alcohol, all of which tend to diminish the disintegration of tissues.

Hüningen (hŭ'ning-en), a town of Germany, in Upper Alsace, formerly fortified. It has a famous imperial fish-breeding establishment. Pop. 3304.

Huns, a nomadic and warlike people of Asia, of Mongolian race, part of whom entered Europe, probably in the fourth century after Christ, conquered the Alans, and drove the Goths out of Dacia. They continued to extend their dominion along the Danube till the time of Attila (434 A.D.), who, uniting the whole Hunnish power under one head became the most powerful prince of his time. (See *Attila.*) His defeat near Chalons was the commencement of the decline of the power of the Huns, and within a generation after his death in 453, the great Hunnish empire had completely disappeared, and the race been absorbed amongst other barbarous peoples. The term Huns was used by ancient and mediæval writers in a very vague way to indicate barbarous hordes invading Europe from the northeast. The Huns are described as a race of dark complexion with small black eyes, flat noses and broad shoulders.

Hunt, JAMES HENRY LEIGH, an English poet and essayist, born at Southgate, near London, in 1784. He was educated at Christchurch Hospital, where he attained some distinction, entered the office of his brother, an attorney, and afterwards obtained a situation in the war office. In 1808, in conjunction with his brother John, he started the *Examiner* newspaper, which soon became prominent for the fearlessness with which public matters were discussed. Ere long official resentment took shape in two prosecutions of the brothers, the second of which, occasioned by an article in the paper of March 22, 1812, reflecting on the character of the prince regent, resulted in the brothers being sentenced to pay a fine of £500 each, and to suffer two years' imprisonment. During his confinement Leigh wrote several works, among which are the *Feast of the Poets*, the *Descent of Liberty* and the *Story of Rimini.* In 1818 appeared *Foliage*, a collection of original poems and translations from Homer, Theocritus, Bion, etc., and in 1819 the *Indicator* was started, a weekly journal on the model

of the *Spectator*, which contained some of his best essays. In 1822 he proceeded to Italy, having received an invitation thither from Byron and Shelley, and, in conjunction with the former, carried on a newspaper called the *Liberal*, but it proved unsuccessful. On his return to England Hunt published *Recollections of Lord Byron and some of his Contemporaries* (two vols., 1828), which provoked somewhat the indignation of the noble poet's friends. Among his subsequent works may be mentioned, *A Legend of Florence*, a play represented with some success at Covent Garden in 1840; *Stories from the Italian Poets* (two vols., 1846); *Men, Women and Books* (1847); *A Jar of Honey from Mount Hybla* (1847); *The Town, its Memorable Characters and Events* (1848); *Autobiography* (three vols., 1850); *Table Talk* (1850). In 1842 Mrs. Shelley settled an annuity of £120 upon Leigh Hunt, and in 1847 a government pension of £200 a year was bestowed on him. He died in 1859.

Hunt, THOMAS STERRY, chemist, born at Norwich, Connecticut, in 1826; died in 1892. He was professor of chemistry at McGill University, 1862-68, and of geology at the Massachusetts Institute of Technology, 1872-78. He contributed many valuable papers to scientific journals, developed an original system in organic chemistry and made important researches into the composition of rocks. In 1859 he invented the green ink with which greenbacks are printed.

Hunt, WILLIAM HOLMAN, an English painter, born in 1827 at London. He was trained in the Royal Academy school, and began to exhibit in 1846. He belongs to the so-called Pre-Raphaelite school of English artists. (See *Pre-Raphaelite School.*) In 1853 his *Claudio and Isabella* first attracted public attention, followed next year by the *Light of the World* (Christ teaching in the temple). Mr. Hunt then made a journey to the East, the fruits of which are observable in the local coloring and strength of realization in his succeeding pictures of Eastern life, among which we may mention *The Scapegoat* (1856); *The Finding of the Saviour in the Temple* (1860); *Shadow of the Cross* (1873); *Plains of Esdraelon* (1877); *Triumph of the Innocents* (1885). Outside of Biblical subjects Mr. Hunt painted some notable pictures: *Isabella and the Pot of Basil, The After-Glow, The Festival of St. Swithin*, etc. He died in 1910.

Hunter, JOHN, surgeon and physiologist, was born at Long Calderwood, Lanarkshire, in 1728. He assisted his brother-in-law, a carpenter in Glasgow, for some time in his trade, but afterwards went as assistant to his brother William, a prosperous surgeon in London. In 1756 he was appointed house-surgeon at St. George's Hospital, and also lectured in his brother's school of anatomy. In 1760, his health needing a change of climate, he became staff-surgeon and went with the army to Portugal. Three years afterwards he returned to London, and, in 1768, was appointed surgeon to St. George's Hospital; in 1790 surgeon-general to the army, and inspector-general of hospitals. He died in 1793.

Hunter, ROBERT (?-1734), one of the ablest of the English colonial governors in America, born in Scotland. He entered the army, and it was with the rank of colonel he was appointed governor of New York (1710). He returned to England in 1719. Some years later he became governor of Jamaica. He was among the most genial of early American statesman, and his experience with his legislative assembly was for the New York people a valuable training in constitutional self-government.

Hunter, ROBERT MERCER TALIAFERRO (1809-87), an American statesman, born in Essex county, Virginia, educated at the University of Virginia. He studied law, and began practice in 1830. Politics early interested him, and at the age of twenty-four he was elected to the state legislature. Elected to Congress in 1837, he made a name for himself as a forceful advocate of free trade, in opposition to Clay's protective policy. He was speaker of the House of Representatives, and was returned to Congress several times. In 1847 he became United States senator, and served till the outbreak of the Civil war, when he withdrew on the secession of Virginia and became the Confederate secretary of state. After the war he was treasurer of Virginia.

Hunter, WILLIAM, physician and anatomist, elder brother of John Hunter, was born at Long Calderwood, Lanarkshire, in 1718; studied at Glasgow with a view to entering the church, but abandoned theology for medicine. In 1741 he went to London, where he became a member of the College of Surgeons; acquired a large practice in surgery and midwifery; was appointed accoucheur to the British Lying-in Hospital, and in 1764 physician-extraordinary to the queen; in 1767 a fellow of the Royal Society; in 1780 foreign associate of the Royal Medical Society at Paris, etc. In 1770 he established a theater of anatomy for his own lectures and a splendid museum for his anatomical preparations, objects of natural history, pictures

of ancient coins and medals, etc. He was the author of some important works, in particular the *Anatomy of the Human Gravid Uterus*, published in 1774. He died in 1783, bequeathing the whole of his splendid museum, valued at £150,000, to the University of Glasgow, with the sum of £8000 in cash to be expended in a building for its reception, and a further sum of £500 per annum to bear the charges of its preservation.

Hunting. See *Fox-hunting.*

Huntingdon (hunt'ing-dun), HUNTINGDONSHIRE, (contracted to HUNTS), a small inland county of England, 30 miles long by 23 broad; area, 359 sq. miles. It has no hill-ranges of importance, and almost the whole area is arable or in pasture. It is watered chiefly by the Ouse and the Never, which form its northern boundary. The soil has been much improved by scientific farming. The northeastern part is included in the great fen district and is principally devoted to grazing. There were here formerly some large lakes or meres, but they have been drained and made available for cultivation. The soil is principally clay, with sand, gravel and peat-earth in places, the latter in the fen district. There are here many relics of the ancient Roman occupation and two Roman roads traverse the county. There are also interesting mediæval ruins and buildings of historic interest. Pop. 57,583.

Huntingdon, a borough, capital of Huntingdonshire, England, on the N. bank of the Ouse, 17 miles N. W. of Cambridge. It has ancient churches and various manufactures, and was the birthplace of Oliver Cromwell. Pop. 4003.

Huntingdon, a borough, county seat of Huntingdon County, Pennsylvania, on the Juniata River, 34 miles E. of Altoona, in the south-center of the State. It is the seat of Juniata College and a State industrial reformatory, and has manufactures, including boilers and radiators, sewer-pipe, knit goods, etc. Two hydro-electric plants furnish cheap electricity. Pop. (1920) 7051.

Huntingdon, SELINA, COUNTESS OF, an English lady, eminent for piety and munificence, daughter of the Earl of Ferrers, was born in 1707, and died in 1791. She was married in 1728 to the Earl of Huntingdon. After his death she joined the Calvinistic Methodists, chose Whitefield for her pastor, and was noted for zeal and devotion. She formed a sect known as the 'Countess of Huntingdon's connection.'

Huntington, a city, capital of Huntington county, Indiana, on the Little River, one mile from the Wabash, with good railroad facilities. It has extensive limestone quarries, and produces lime, cedar chests, machinery, shears, furnaces, rubber specialties, pianos, boots and shoes, etc. Pop. 14,000.

Huntington, a city, county seat of Cabell Co., West Virginia, on Ohio River, 265 miles below Pittsburgh, on the Chesapeake & Ohio and the Baltimore & Ohio railroads. Products of its manufactures comprise wood, glass, clay, iron and tobacco. Marshall College, St. Edwards College and the Huntington State Hospital are located here. Pop. (1910) 31,161; (1920) 50,177.

Huntington, a town of Fairfield Co., Connecticut, 13 miles W. of New Haven. It has saw mills and various manufactures. Pop. (1920) 9475.

Huntington, COLLIS POTTER. An American railroad builder, born in 1821 at Harwinton, Connecticut; died 1900. He became associated with Leland Stanford, Mark Hopkins and Charles Crocker in the planning and construction of the Central Pacific Railway (1869) and later the Southern Pacific (1881) and the Chesapeake and Ohio railroads and became the operating head of these systems and others. He gave liberally to educational institutions.

Huntington, DANIEL, artist, was born in New York City in 1816; died in 1906. In 1862-69 he was president of the National Academy, and again in 1877-91. Among his works are *A Toper Asleep*, *Mercy's Dream*, and portraits of Lincoln and Louis Agassiz.

Huntsville, a city, county seat of Madison Co., Alabama, 111 miles N. of Birmingham, in the Tennessee Valley, famous for its cotton, fruit and livestock. It has cotton mills, iron and steel plants, oil and fertilizer mills, etc. It was the first capital of Alabama, 1820. Pop. (1920) 8018; within a 4-mile radius, 29,850.

Hunyady Janos (hun'ya-di), a famous Hungarian soldier, born in Hunyad, Transylvania, about 1395; died in 1456. His life was devoted to an almost unceasing contest with the Turks, in which he showed striking military ability. His most celebrated exploits were the expulsion of the Turks from Transylvania in 1441, the brilliant campaign south of the Danube in 1442, and the storming of Belgrade in 1456. He was defeated at the battles of Varna and Kossova. He acted as co-regent and governor of the kingdom, 1446-53, and one of his sons succeeded to the crown.

Hura (hū'ra), a genus of tropical American plants, nat. order Euphorbiaceæ. *H. crepitans*, the sand-box tree, is remarkable for the loud report with which its seed-vessels burst. It is a large, branching tree with glossy, poplar-like leaves, inconspicuous diœcious flowers, and large, furrowed, roundish fruits of the size of an orange.

Sand-box Tree (*Hura crepitans*).

Hurdles (hur'dlz), frames formed of perpendicular stakes with horizontal bars, and braced with diagonal pieces for the purpose of forming temporary fences. In fortification the name is given to a collection of twigs or sticks closely interwoven and sustained by long stakes, serving to render works firm, or to cover trayerses and lodgments for the defense of workmen against firearms or stones.

Hurdwar. See *Hardwar.*

Hurdy-gurdy (hur'di-gur'di), a very old stringed instrument played by turning a handle. Its tones are produced by the friction of a wheel acting the part of a bow against four strings, two of which are pressed by the fingers or by keys. The other two strings are turned a fifth apart to produce a drone bass, and are not stopped by the fingers or keys.

Hurlbut (hurl'but), STEPHEN AUGUSTUS, an American soldier and politician, born at Charleston, S. C., 1815; died in Peru, 1882. He practiced law and was in the Illinois State Legislature from 1859 to 1861. During the Civil war he was promoted to major general of volunteers and commanded the 16th Army Corps in Sherman's Mississippi campaign of 1864. He was U. S. Minister to Colombia and Peru.

Huron, county seat of Beadle Co., South Dakota, on James River, and on Chicago & Northwestern and Great Northern railroads. Livestock and farm center. Seat of Huron College. Pop. 8302.

Huron (hū'run), LAKE, one of the five great lakes on the frontiers of the United States and Canada. It is the third in size, being 218 miles long north and south, and (exclusive of Georgian Bay) 105 miles broad at its widest part with an area of about 23,000 sq. miles. It lies 581 feet above sea-level. The lake contains several thousand islands, varying in size from a few square feet to huge islands like the Great Manitoulin, which is about 80 miles long. The waters have a mean depth of 250 and a maximum of 750 feet.

Huronian Rocks, in geology, a term applied to certain Archæan rocks on the banks of Lake Huron, consisting of schists, sandstones, grits, and igneous rocks.

Hurons. See *Wyandots.*

Husband and Wife, a man and woman united by lawful marriage. The personal rights of the husband and the wife are in the United States decidedly limited. The husband has no right of chastisement, as under the common law, although he is still the recognized legal head of the family. But the domicile of the wife follows that of the husband. His duty is to support the family. The wife's duty is to render household services. The husband is not held liable for crimes and torts committed by his wife, in his presence, unless the tort was committed as agent of the husband, or the crime at his instigation, or with his help, in which case he is guilty as an accomplice. A married woman has all the rights, in respect to property, real and personal, and the acquisition, use, enjoyment, and disposition of it, which she would have if she were unmarried. She can make contracts with any person, including her husband; she may carry on any business, trade, or occupation; she may exercise all powers and enjoy all rights in respect to her property and her contracts, and she is subject to all liabilities which flow from her independent status. All sums which may be recovered in actions or special proceedings by a married woman to recover damages to her person, estate, or character, are her separate property. Judgment for or against a married woman may be rendered and enforced, in a court of record, or not of record, as if she were single. If a husband abandons his wife or children he may be arrested and punished. Magistrates' courts usually have jurisdiction over cases of abandonment and non-support.

Huskisson (hus'kis-un), WILLIAM, an English statesman, born in Worcestershire, in 1770. In 1827 he became Secretary of State for the colonies and was a recognized

authority on all questions of trade and commerce. In 1828 a misunderstanding with the Duke of Wellington, then at the head of the cabinet, led to his withdrawing, along with other Tories, from the administration. He was accidentally killed at the opening of the Liverpool and Manchester Railway, September 15, 1830.

Huso (*Acipenser huso*), the great or white sturgeon. See *Sturgeon.*

Huss, or Hus, John, a Bohemian religious innovator, born about 1373. He studied at the University of Prague, took the degree of Master of Arts in 1396, and in 1398 began to lecture on theology and philosophy. In 1401 he was made dean of the faculty of philosophy, became the leader of the Bohemian in opposition to the German professors and academicians, and after the withdrawal of the latter to Leipzig, was made rector of the university (1409). Since 1391 he had been acquainted with the writings of Wickliffe, and his denunciation of the papal indulgences, of masses for the dead, of auricular confession, etc., alarmed Archbishop Sbynko of Prague, who had 200 volumes of Wickliffe's writings burned (1410) in the archiepiscopal palace, and the preaching in Bohemian prohibited. Huss appealed to the pope, John XXIII, who summoned him to appear at Rome. Huss refused to appear, and was in consequence excommunicated, and Prague laid under an interdict as long as Huss should remain in it. The people of Prague, however, stood by their preacher, and the pope was compelled to acquiesce. But the quarrel broke out again when Huss and his friend Jerome publicly condemned the papal indulgences granted for the crusade against Ladislaus of Naples. Huss was again excommunicated and Prague interdicted. The reformer now retired to Hussinatz to the protection of his feudal lord, and here he wrote his books *On the Six Errors* and *On the Church*, in which he attacks transubstantiation, the belief in the pope and the saints, the efficacy of the absolution of a vicious priest, unconditional obedience to earthly rulers, and simony, which was then extremely prevalent, and makes the Scriptures the only rule of matters of religion. The approbation with which these doctrines were received, both among the nobility and common people, increased the party of Huss in a great degree, and emboldened him to comply with the summons of the Council of Constance to defend his opinions before it. The Emperor Sigismund, by letters of safe conduct, became responsible for his personal safety; and John XXIII, after his arrival at Constance, November 4, made promises to the same effect. Notwithstanding this, he was thrown into prison, November 28, and after several public examinations, conducted with a view to making him retract opinions deemed heretical, he was sentenced to death on July 6, 1415, and burned alive the same day, and his ashes thrown into the Rhine. See also *Hussites.*

Hussars (hö-zärz'), originally the name of the Hungarian cavalry, raised by Matthias I in 1458. Every twenty houses were obliged to furnish a man, and thus from the Hungarian word *husz* (twenty) was formed the name *Huszar, Hussar,* afterwards applied generally to light cavalry, similarly dressed and armed, of other European armies.

Hussites (hus'īts), the followers of John Huss. After the death of Huss, his adherents took up arms for the defense of their principles, and under the leadership of Johann Ziska, captured Prague, fortified Mount Tabor, and repeatedly defeated the troops sent against them by the Emperor Sigismund, who had succeeded to the crown of Bohemia. Ziska died in 1424, and was succeeded by Procopius, who also distinguished himself by many victories. The excesses of this party, however, who were called the *Taborites*, alienated the moderate Hussites, who called themselves *Calixtinès*, and who finally united with the Catholics by the Compact of Prague in 1433 to acknowledge Sigismund as king; certain concessions, especially the use of the cup for the laity, having been made to them by the Council of Basel. The Taborites, thus weakened, were totally defeated at Bömischbrod on 31st May, 1434, and afterwards declined as a political party, finally becoming merged in the Bohemian Brethren. See *Bohemia, Bohemian Brethren.*

Hustings (hus'tingz), (1) a name given to a court formerly held in many cities of England, as York, Winchester, Lincoln, but especially applied to the county court of the city of London held before the lord-mayor, recorder and sheriffs. (2) The platform from which candidates for seats in Parliament addressed the constituency on their nomination previous to the Ballot Act of 1872.

Husum (hö'zum), a seaport of Prussia in Schleswig-Holstein, with a good trade. Pop. 8268.

Hutcheson (huch'e-sun), Francis, philosophical writer, born in Ireland in 1694. He studied at the University of Glasgow from 1710 to 1716, was licensed to preach, but se-

up a private academy in Dublin. In 1725 his celebrated *Inquiry into the Ideas of Beauty and Virtue* appeared, followed in 1728 by his *Treatise on the Passions*. In 1729 he was called to the chair of moral philosophy at Glasgow. The main features of his philosophical teachings are the theory of a distinct moral sense or conscience peculiar to man, and his view of virtue as benevolence. Hutcheson's moral philosophy is strongly opposed to the empiricism of Locke, and in this respect he may be considered as the precursor of Reid and the Scottish school of philosophy. In 1755 a *System of Moral Philosophy* was published from his MSS.

Hutchinson, ANNE (1590–1643), noted religious enthusiast, daughter of a clergyman of Lincolnshire, England, was born in 1590; married William Hutchinson, and in 1634 emigrated to Boston. She held meetings, lectured, and denounced the Massachusetts clergy as being with few exceptions 'under the covenant of works, not of grace.' Her followers were charged with Antinomianism and she was banished from the colony. She and her friends acquired territory from the Narragansett Indians of Rhode I., where they set up a community on the principle that no one was to be 'accounted a delinquent for doctrine.' After the death of her husband (who shared her opinions) she removed to a new settlement near Stamford, Conn., and in 1643 she and her whole family of fifteen persons (one daughter excepted) were massacred by Indians.

Hutchinson, a city, county seat of Reno Co., Kansas, on the Arkansas River, 40 miles N. W. of Wichita, on Santa Fé, Rock Island and Missouri Pacific railroads. It has extensive manufactures of salt, soda ash, strawboard, flour, etc., also packing plant, canneries and lumber interests. Pop. (1910) 16,364; (1920) 23,298.

Hutten (fon hō'ten), ULRICH VON, a German knight, distinguished for the influence which his writings exercised upon the Reformation, was born at the family castle of Steckelberg on the Main, in 1488, and educated at the famous monastic school of Fulda. He led a wandering and unsettled life, sometimes appearing as the man of letters and controversialist, at other times as the soldier. His first attacks on the Roman Church were in connection with his defence of the persecuted Reuchlin, and with the issuing of the *Epistolæ Obscurorum Virorum* (which see). In 1517 he was crowned laureate at Augsburg, and knighted by the emperor. A year or two after he retired to his fraternal castle to write work after work, addressing the people, like Luther, in their native German, and denouncing the arrogance and corruption of Rome. The Roman authorities at length began to move against him, and he fled to the castle of his friend Franz von Sickingen, and from that again to Switzerland, where he died in 1523.

Hutton (hut'ton), CHARLES, an English mathematician, born at Newcastle-upon-Tyne, in 1737. He was first a teacher of mathematics at Newcastle, but having published in 1772 a small work on the *Principles of Bridges*, which attracted attention, he was next year appointed professor of mathematics at Woolwich College. In 1785 he published his *Mathematical Tables*, followed not long after by his *Tracts, Mathematical and Philosophical* and *Elements of Conic Sections*. His *Mathematical and Philosophical Dictionary* appeared in 1795-96; his *Course of Mathematics* in 1798, with an additional volume in 1811. In 1812 he published another collection of *Tracts* on mathematical and philosophical subjects. He died in 1823.

Hutton, JAMES, a Scottish geologist, born at Edinburgh in 1726. He studied at the university there and at Leyden, where he was graduated as M.D. in 1749. Returning to Scotland, he settled for a time on a farm of his own in Berwickshire, but about 1768 went to Edinburgh, and devoted himself to scientific researches. His name is especially connected with a geological system, the chief features of which are his recognition of the similarity of processes in the past and present, and his theory of igneous fusion as accounting for most geological phenomena. Among his numerous works are an *Investigation of the Principles of Knowledge*, a *Theory of Rain* and a *Theory of the Earth, with Proofs and Illustrations* (1795). He died in 1797.

Huxley (hukz'li), THOMAS HENRY, an English naturalist, born at Ealing, Middlesex, in 1825. He was graduated M.B. at the University of London in 1845, and entered the royal navy as assistant surgeon in 1846. Sailing in the *Rattlesnake* on a surveying expedition to Australia, he sent a number of valuable papers to the Royal Society. He held numerous educational and other positions, was president of the British Association in 1870, was elected lord-rector of Aberdeen University in 1872, was secretary of the Royal Society, and a member of various royal commissions, etc., resigning nearly all his positions in 1885 on account of ill health. He was made a member of the privy council in 1892. Among his

works are *The Occanic Hydrozoa* (1857), *On the Theory of the Vertebrate Skull, Man's Place in Nature* (1863), *Elements of Comparative Anatomy* (1864), *Elementary Physiology* (1866), *Lay Sermons, Addresses and Reviews* (1870), *Physiography* (1877), *Anatomy of Invertebrate Animals* (1877), *The Crayfish* (1879), *Science and Culture* (1882). He was a very popular lecturer, and stood in the foremost rank among biologists, strongly sustaining the Darwinian theory. In 1876 he visited America, delivering a series of lectures on fossil horses; his first address was at Johns Hopkins University. He died in 1895.

Huy (wē), a fortified town of Belgium, province of and 18 miles southwest of Liège and 19 miles east of Namur. It is situated on the Meuse, which is crossed here by an important bridge. It was the scene of a desperate battle in August, 1914, at the opening of the European war. The German troops after demolishing the forts at Liège advanced on Huy, but the Belgians met them with a stout resistance, which was only overcome after a prolonged engagement, the invaders suffering heavy casualties. The town was occupied August 16 by the Germans. In the many wars that have swept over this region Huy has suffered again and again. It was captured by the Dutch and then by the French, and changed hands repeatedly. Records of the town date back to the 7th century, and some authorities assert that it was founded by the emperor Antonius in 148 A. D. The population in 1904 was 14,164; in 1910 it had grown to 14,545.

Huygens (hoi'gens), CHRISTIAN, a Dutch mathematician and physicist, born in 1629. He studied at Leyden and at Breda, where he went through a course of civil law from 1646-48. He made several journeys to Denmark, France and England; in 1666 settled at the invitation of Colbert in Paris, where he remained till 1681, when he returned to Holland on account of his health. He died at The Hague in 1695. Among his most important contributions to science are his investigations on the oscillations of the pendulum, and his *System of Saturn*, in which he first proved that the ring completely surrounds the planet, and determined the inclination of its plane to that of the ecliptic. In 1690 he published important treatises on light and on weight. His *Traité de la Lumière* was founded on the undulation theory, but in consequence of the prevalence of the Newtonian theory it was long neglected till later researches established its credit.

Huysum (hoi'sym), JAN VAN, a distinguished Dutch flower and fruit painter, born at Amsterdam in 1682. He worked at first with his father Justus Huysum, a picture dealer and painter, but afterwards set up on his own account, devoting himself to the painting of fruit and flowers, in which he reached the highest perfection, surpassing all his predecessors in softness and delicacy of color, fineness of penciling and exquisite finish. He was extremely jealous of rivalry, and kept his methods of working, preparation of colors, etc., a deep secret. He died at Amsterdam in 1749. His brother JUSTUS was a battle painter, and died at the age of twenty-two years. Another brother, JAKOB, copied his brother's flower and fruit pieces so perfectly that they have been mistaken for that master's work. He died in England in 1740.

Hwang-Ho. See *Hoang-Ho.*

Hyacinth (hī'a-sinth), a genus of liliaceous bulbous plants, including about thirty species, among which the garden hyacinth (*Hyacinthus orientālis*) is celebrated for the immense varieties which culture has produced from it. It is a native of the Levant, and was first cultivated as a garden flower by the Dutch about the beginning of the sixteenth century.

Hyacinth, or JACINTH, a variety of the mineral zircon, whose crystals, when distinct, have the form of a four-sided prism, terminated by four rhombic planes, which stand on the lateral edges. Its prevailing color is red, more or less tinged with yellow or brown. The name hyacinth is also given to varieties of the garnet or cinnamon stone, the sapphire, and topaz.

Hyades (hī'a-dēz), a cluster of five stars in the constellation Taurus, supposed by the ancients to indicate the approach of rainy weather when they rose with the sun.

Hyæna. See *Hyena.*

Hya-hya (*Tabernæmontanautilis*), a milky plant of South America. See *Cow-trees.*

Hyalite (hī'a-līt), a pellucid variety of opal, resembling colorless gum or resin.

Hyatt (hī'at), ALPHEUS, scientist, born at Washington, D. C., in 1838; died in 1902. He served with distinction in the civil war, held professorships in leading scientific institutions, and in 1881 became professor of zoölogy and palæontology in the Massachusetts Institute of Technology. He was subse-

quently curator of the Boston Society of Natural History. He wrote *Memoirs on the Polyzoa, Guides for Science Teaching*, etc.

Hyatt, JOHN WESLEY, inventor, was born at Starkey, New York, in 1837. His inventions were chiefly that of celluloid, which became an enormous industry, a solvent for pyroxylin, and a water purifying system.

Hybla (hī'bla), a mountain in Sicily, where thyme and odoriferous flowers of all sorts grow in abundance. It was famous in ancient times for its honey.

Hybrid (hī'brid), the produce of a female animal or plant which has been impregnated by a male of a different allied species or genus. Much uncertainty prevails respecting the productive crossing of species, but it seems to be established that while the crossing of different genera may result in offspring, that of different orders will not. Hybrids are obtained among fishes from different species of carp; among birds, from the goldfinch and canary, the swan and the goose, etc.; among mammals, from the horse and the zebra, the horse and the ass, the produce of the last two being the mule proper; from the lion and tiger, the dog and wolf, the dog and fox, the goat and ibex. Instances of hybrids between animals of different genera have been furnished by the union of the goat and the antelope, and of the stag and the cow. It used formerly to be considered that the propagative power of hybrids was either absolutely null, or that they propagated only with an individual of the pure breed; but the experiments of Dr. Darwin and other recent researches have shown that although infertility to some degree generally attends sexual intercourse between different species, yet in such intercourse every degree of difference from absolute sterility up to complete fertility is found. The results hitherto obtained may be summarized as follows:—The crossing of species of different families is in almost every case infertile; allied species are capable of producing offspring, and this capability is in indefinite ratio to the degree of their likeness; hybrids are frequently fertile with their parents, but more rarely among themselves; there is no fixed relation between the degree of fertility manifested by the parent species when crossed and that which is manifested by their hybrid progeny. In many cases two pure species can be crossed with unusual facility, while the resulting hybrids are remarkably sterile; and, on the other hand, there are species which can only be crossed with extreme difficulty, though the hybrids when produced are very fertile.

Hycsos (hik'sōs), or HYKSHOS, or Shepherd Kings, wandering tribes of Semitic descent, who conquered the whole of Egypt about 2100 B.C., and were driven out some five hundred years afterwards. The only detailed account of them in any ancient writer is a passage of a lost work of Manetho, cited by Josephus. Their epoch covers the thirteenth to the seventeenth dynasties.

Hydaspes (hī'dus-pēz), ancient name of a river of India, the modern Jehlam, or Jhilam.

Hydatid (hī'da-tid), a term applied to a kind of bladder-worm, which is the larval stage of a small tapeworm, the *Tænia echinococcus*, found in the dog and wolf. The hydatid consists of an external sac, which is derived from the tissue of the organ in which it is situated, and which is filled with buds or capsules containing the larvæ of the worm.

Hyde (hīd), a town of England, in Cheshire, about 7 miles E. S. E. of Manchester. The inhabitants are largely employed in cotton manufacture and coal mines. There are also iron foundries and engineering works. Pop. (1911) 33,444.

Hyde, or HIDE, measure of land, frequently mentioned in Domesday-book and in old English charters, and variously estimated as equivalent to 60, 80, and 100 acres—a fact which may be accounted for on the supposition that the quantity was always determined by local usage. It was such a portion of land as might be ploughed with one plough. The hyde at present is reckoned at 100 acres.

Hyde Park, a town of Suffolk county, Massachusetts, 8 miles S. by W. of Boston. It is situated on the Neponset River, has various manufactures and is a place of residence for Boston business men. Pop. (1910) 15,507.

Hyde Park, a London park containing about 400 acres, and having on the west Kensington Gardens. It abounds with fine trees, and is the great fashionable promenade and public lounge of Western London. It contains the Rotten Row, a piece of road set apart for equestrians; the Serpentine, a large sheet of ornamental water, much frequented in summer for bathing, and during frosts for skating; and the Albert Memorial, a structure in memory of the Prince Consort.

Hyderabad, or HAIDARABAD (hī-dər-ä-bâd'), a state of Hin-

dustan, which comprehends the greater part of that central plateau of Southern India known as the Deccan, and is in possession of a Mohammedan prince, the Nizam; area 82,700 sq. miles, exclusive of the Berar or Hyderabad Assigned Districts under British administration. The country is intersected or bounded by the Godavery, Kistnah, and their tributaries. The soil is fertile, though much good land is not yet brought under cultivation. The chief products are rice, wheat, maize, sugar-cane, tobacco, cotton, indigo, fruits and timber. Pop. 11,174,897. The ruler of Hyderabad belongs to a dynasty founded by Asaf Jah, a distinguished soldier, whom the Emperor Aurungzebe made viceroy of the Deccan in 1713, with the title of Nizam or Regulator. Mir Mahbub Ali, the present Nizam, was born in 1866, and is in point of rank the first Mohammedan ruler in India, with a regular army of about 15,000, besides numerous irregulars.—HYDERABAD, the capital, is situated on the River Musi, at an elevation of 1672 feet above the sea. It is surrounded by a stone wall flanked with bastions, forming an irregular quadrangle about 2¾ miles upon the river and 2 miles broad. Among the chief buildings are the extensive palace of the Nizam, the British residency, the Char Minar, or Four Minarets, built about 1590 as a Mohammedan college, but now used for warehouses; the Jama Masjid, or cathedral mosque, designed after the one at Mecca. There are manufactures of silks, trinkets, and turbans. Pop. of city, with suburbs, is given as 500,623.

Hyderabad, or HAIDARABAD, a town of Hindustan, capital of Hyderabad District, Sind. It is situated on a rocky eminence about 3 miles from the eastern bank of the Indus. The streets are narrow and dirty, and the houses mere hovels. The fort contains the arsenal of the province of Sind and the palace of the Emirs. The principal manufactures are arms, silks, cottons, and lacquered ware. Pop. 75,952.

Hyder Ali (hī'der ä'lē), a distinguished Indian prince, born in 1728, son of a general in the service of the Rajah of Mysore. By his military talents he became the actual ruler of Mysore, and in 1762 deposed Kandih Rao, and had himself chosen Rajah. He encouraged agriculture and commerce, reorganized the army, and so greatly extended his dominions that in 1766 they contained 84,000 sq. miles, and afforded an immense revenue. In 1780 he formed an alliance with the Mahrattas against the English, took Arcot, but was defeated by Sir Eyre Coote, June 1, 1781. The Mahrattas now joining in a league against him, he carried on a disadvantageous war, during the continuance of

Hyder Ali.

which he died, in 1782. He was succeeded by his son, Tippoo Saib.

Hydra (hī'dra), in Greek mythology, a celebrated monster, which infested the neighborhood of Lake Lerna, in the Peloponnesus. Some accounts give it a hundred heads, others fifty, others nine. As soon as one of these heads was cut off two immediately grew up if the wound was not stopped by fire. It was one of the labors of Heracles to destroy this monster, and this he effected with the assistance of Iolaus, who applied a burning iron to the wounds as soon as each head was cut off. See *Heracles.*

Hydra, an island of Greece, on the east coast of the Morea; length, 12 miles; breadth, about 3. Its surface, though not very elevated (highest point 1939 feet), is almost entirely composed of bare, sterile rocks; and the inhabitants, most of whom live in the town of Hydra, on the northwestern shore, are engaged in trade and commerce. During the war of independence the security which the island afforded raised its population for a time to 40,000; and the Hydriotes, with their fleet, played an important part in the struggle. Pop. of island, 7342; of the town, 6446.

Hydra (in zoölogy). See *Hydrozoa.*

Hydrangea (hī-dran'jē-a), a genus of shrubs or herbs of the nat. order Saxifragaceæ, containing

about thirty-three species, natives of Asia and America. The garden hydrangea (*H. hortensis*) is a native of China and was introduced into Britain by Sir J. Banks in 1790. It is a favorite for the beauty and size of its flowers.

Hydrates (hī'drātz), compounds of water with elementary substances or with other compounds. Hydroxide has much the same significance, but in the hydrate the water is supposed to retain its integrity, while in the hydroxide its elements have entered into new combinations.

Hydraulic Crane (hī-draw'lik), a crane wrought by the pressure of water applied on the principle of the hydraulic or hydrostatic press (which see). The mechanism consists of one or more such presses, with sheaves or pulleys and chains for the purpose of obtaining an extended motion in the chain from a comparatively short stroke of the piston. The power is applied not only for lifting the load, but also for swinging the jib, which latter object is effected by means of a rack or chain operating on the base of the movable part of the crane, and connected either with a cylinder and piston having alternate motion, like that of a steam-engine, or with two presses applied to produce the same effect by alternate action.

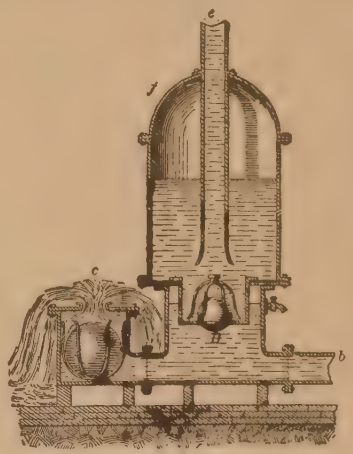
Hydraulicon (hī - draw'li-kon), an ancient musical instrument played by means of water; a water organ.

Hydraulic Engines, engines of which the motive power is water under pressure. In principle they do not differ essentially from steam engines, the water pressure acting on a piston or plunger in a cylinder, or on a revolving piston similar to that of a rotary steam engine.

Hydraulic Mining, a system of mining in which the force of a jet of water is used to sluice down a bed of auriferous gravel or earth, which is passed through sluices to detain the particles of gold.

Hydraulic Press, known also as *Hydrostatic Press* or *Bramah's Press.* See *Hydrostatic Press.*

Hydraulic Ram, a machine for raising water, and depending for its action on the impulse of flowing water. The water falling from a reservoir passes into a pipe or chamber (*b*), at the end of which there is a ball valve (*c*). The rush of supply water at first closes this, and the water finding no exit there acquires pressure enough to open another valve (*d*) and pass into an air vessel placed over it (*f*). The cessation of pressure at valve *c* allows it to fall again; an outrush of water takes place there, relieving valve *d*, which again closes. The pressure of the flowing water upon valve *c* once more closes this valve, and valve *d* again opens,



Hydraulic Ram.

and an additional quantity of water is forced into the air-vessel; and so on by a series of pulsations which send the water along the service pipe, and, in properly arranged machines, raise it to a very considerable height, although the impulse is derived only from the fall of a few feet.

Hydraulics, that part of mechanical science which has to do with conducting, raising and confining water, or of applying it as a motive power. It thus has to do with the flow of water in pipes or channels, and with the various machines in which water is utilized such as water wheels, pumps, turbines, the archimedean screw, the Barker's mill, the hydraulic ram, the hydraulic crane, the hydraulic press, etc.

Hydride (hī'drīd), a substance consisting of hydrogen combined with a metal, or some other base.

Hydro-aeroplane (hī'drō-ā'er-ō-plān), an aeroplane to which pontoons or light boats have been attached to enable it to float or move on the surface of the water. This device has been much used by aeronauts of recent years because of the greater ease and safety in rising from and landing on the water. The term "fly-

ing-boat' is sometimes applied to machines of this type.

Hydrocarbons (hī-drō-kär'bunz), in chemistry a series of compounds which consist of carbon and hydrogen only. They are produced chiefly by the decomposition of organic substances, either slowly by natural causes, or by artificial means, as in the case of the destructive distillation of coal for the purpose of making gas. Certain of the hydrocarbons are also found in the gums of trees. Among the best known are paraffin, benzine and turpentine.

Hydrocele (hī'dro-sēl), a collection of serous fluid in some of the coverings of the testicle or spermatic cord, or in the areolar texture of the scrotum. It is generally the result of a strain or an inflammation of the testes. A large tumor is formed, filled with fluid, which has to be frequently drawn off. Radical cure in adults is effected by tapping or by incision.

Hydrocephalus (hī-drō-sef'a-lus), an accumulation of fluid within the cavity of the cranium; dropsy of the brain. See *Dropsy.*

Hydrocharidaceæ (hī-drō-char-i-dā'se-ē), a nat. order of monocotyledonous floating and creeping plants, inhabiting ditches, rivers and lakes in various parts of the world. See *Anacharis.*

Hydrochloric Acid (hī-drō-klō'rik), or MURIATIC ACID (H Cl), a gaseous compound of equal volumes of hydrogen and chlorine. It is evolved during volcanic eruptions, and is found in the water which collects in the crevices of mountains, and in rivers which rise in volcanic formations. It may be produced by decomposing common salt with sulphuric acid, or by bringing equal volumes of chlorine and hydrogen together and exposing the mixture to diffused daylight without condensation. It explodes in direct sunlight. Hydrochloric acid is colorless, has a pungent odor and an acid taste. It is quite irrespirable, extinguishes flame and dissolves very readily in water. The chief use of hydrochloric acid in the arts is to supply chlorine. It is also used in the preparation of glue, phosphorus, carbonic acid, etc. In medicine it is used diluted as a tonic and astringent. In a concentrated form it is a powerful caustic.

Hydrocyanic Acid (hī-drō-sī-an'-ik). Same as *Prussic Acid* (which see).

Hydrodynamics (hī-drō-dī-nam'-ikz), a branch of the general science of dynamics, treating specially of the laws of force as applied to fluids. It is divided into *hydrostatics*, which is concerned with forces applied to fluids at rest, and *hydrokinetics*, which treats of the application of forces so as to produce motion in fluids. The term hydrodynamics is, however, very often used in the latter sense, being thus opposed to hydrostatics. The name *Hydraulics* is given to the subject when considered with respect to its practical bearing on engineering science.

Hydro-electric Machine, a machine in which electricity is generated by the friction of steam against the sides of orifices through which it is allowed to escape under high pressure.

Hydrofluoric Acid (hī-drō-flûr'-ik), or FLUOHYDRIC ACID (H F), an acid which may be obtained either in the liquid form or in the anhydrous form, as a colorless gas. Both the dry and the liquid form act upon the skin with great virulence. Hydrofluoric acid is used chiefly for etching upon glass. The glass is covered with a thin coating of etching wax, and the design is traced through the wax down to the glass with a fine-pointed instrument. The plate is then treated with an aqueous solution of the acid or is exposed to the gas itself. After a sufficient length of time the wax is dissolved away and the design becomes visible. In chemistry hydrofluoric acid is used to decompose and dissolve silicates in mineral analysis.

Hydrogen (hī'dru-jen), an important elementary substance, one of the elements of water and a component of all vegetable and animal products. It may be obtained by passing the vapor of water over red hot iron filings, or by submitting water to the action of an electric current, whereby it is decomposed into its elements hydrogen and oxygen. Pure hydrogen is a colorless, tasteless, inodorous gas; it is very inflammable, burning with a pale, very slightly luminous, but intensely hot flame; it is a powerful refractor of light; the least dense and the most rapidly diffusible of all the gases and the lightest body in nature, being about 14½ times lighter than atmospheric air, with a specific gravity of .0693. In consequence of its extreme lightness it is the recognized standard of unity in referring to the atomic weight of bodies, and it has also been assumed as the unit in speaking of the specific gravity of gases, although common air is the more generally received standard. Hydrogen cannot support respiration, but is not directly poisonous,

death ensuing from mere absence of oxygen. Two volumes of hydrogen with six of air form an explosive mixture. The most intense heat that can be produced is caused by the burning of hydrogen in oxygen gas, and this principle has been applied to increase the temperature of blast-furnaces in iron-works by making the gases pass separately through heated tubes to the furnace. Hydrogen is only slightly soluble in water, nor is there any other liquid which is capable of dissolving it in great quantity. Hydrogen gas can be liquefied by exposure to 650 atmospheres pressure and —140°C., but remains liquid at 320 atmospheres pressure, the temperature remaining the same. It was solidified in 1899 by causing it to evaporate when in the liquid state. It unites with all other elementary gaseous bodies, and forms with them compounds, not only of great interest, but of vast importance and utility; with nitrogen it forms ammonia; with chlorine, hydrochloric acid; with fluorine, hydrofluoric acid, etc.

Hydrography (hī-drog'ra-fi), that branch of geographical science which has for its object the description and natural phenomena of the water on the surface of the globe, whether in seas, lakes, or rivers. It may deal with the rivers, watersheds, lakes, etc., of a particular country; and it also embraces the determination of winds, currents and other departments of marine surveying. In Britain, France, the United States, etc., there are hydrographic departments kept up by government, which publish accurate charts of coasts, issue sailing directions, etc.

Hydrokinetics (hī-dru - kī-net'ikz), that branch of hydrodynamics which treats of the application of forces producing motion in fluids, having thus to do with the flow of liquids in pipes, its issue from orifices under certain pressures, etc. See *Hydrodynamics*.

Hydrometer (hī-drom'e-tėr), an instrument primarily for determining the specific gravity of fluids, though some of them can also determine the specific gravity of solids. The hydrostatic principle on which the use of the hydrometer depends is the well-known one that when a solid body floats in a liquid, and thus displaces a quantity of the liquid, the weight of the solid body is equal to the weight of the liquid that it displaces. The density of the liquid is determined either by observing the depths to which the hydrometer sinks in the liquid (the hydrometer of variable immersion) or the weights required to make it sink to a given depth (the hydrometer of constant immersion). Of the second kind of hydrometer Nicholson's is a good example. It consists of a hollow cylinder of metal, surmounted with a very fine metallic stem, to the top of which there is attached a plate or pan for weights. From the bottom of the metallic cylinder hangs a kind of cup or basket. The whole instrument is weighted so as to float upright. On the fine metallic stem there is a marked point; and by putting weights on the upper pan the hydrometer is always made to sink precisely to this point. Thus the volume immersed is always the same. From what was said above, it is seen at once that different weights are required to sink it to the marked point in different liquids, the denser the liquid the greater being the weight required; and if the weight of the instrument itself is known, and also the *standard weight*, or weight required to sink it to the marked point in distilled water, the calculation of the specific gravity of any liquid from an observation with the instrument is very easy. But the specific gravity of solids can also be found by means of Nicholson's hydrometer, for which purpose the instrument is placed in distilled water and the solid body is put on the upper pan. Weights are then added till the hydrometer sinks to the marked point. But the *standard weight* of the instrument being known, it is plain that the difference between it and the weights that must be added on the upper pan to the weight of the body whose specific gravity is to be determined must be the weight in air of that body. The body is now transferred to the basket below the instrument, and the additional weights which must now be placed in the dish represent the weight of water displaced by the solid; and the weight of the solid itself divided by this weight is the specific gravity required. Hydrometers of variable immersion are usually made of glass. Each of them has a large hollow bulb, below which there is a smaller bulb weighted with mercury to make the instrument float upright. The stem is cylindrical and is graduated, the divisions being frequently marked on a piece of paper inclosed within the stem. The depth to which the hydrometer sinks in the liquid gives the density.

Hydrometer

Hydromys (hī'drō-mis), a genus of water-mice found in Australia and adjacent islands, distinguished

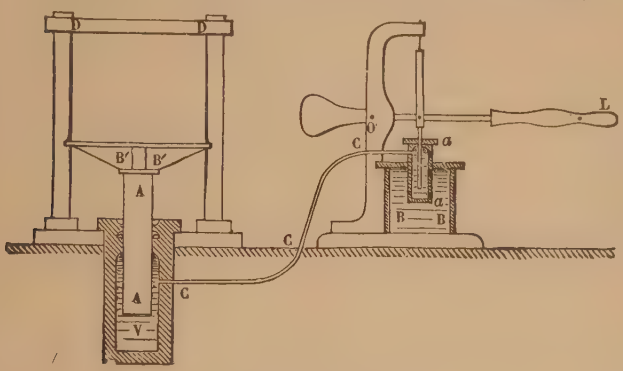
from all other rodents by its small number of molar teeth. The largest species is twice the size of a common rat. In Tasmania they are called beaver-rats, are nocturnal and very shy, inhabit the banks of both fresh and salt water, and swim with the help of partly-webbed hind feet.

Hydropathy (hī-drop'a-thi), a method of treating diseases by the use of pure water both internally and externally, which has come extensively into practice. The system was originated by Vincent Priessnitz, a Silesian peasant, who in 1829 established at his native village of Gräfenberg an institution for the hydropathic treatment of diseases, and invented a variety of forms in which the water cure might be applied, such as the wet-sheet pack, the dry blanket or sweating pack, the sitz, douche, plunge, wave, etc., baths. The new system soon acquired popularity, and the original establishment expanded into an extensive suite of buildings. Other hydropathic institutions soon sprung up in other parts of Germany. In 1842 a hydropathic society was formed in London, and ere long numerous establishments were erected all over the United Kingdom. Before Priessnitz's death in 1851 he had the satisfaction of seeing his system adopted throughout Europe, as well as in the United States, where it was introduced in 1843 and spread widely, though it is now little used. In many cases there can be no doubt of patients having received great and lasting benefit by a sojourn at a hydropathic institution, and the free use of water in its various forms of appliance; but it may well be doubted whether these advantageous results are not as much to be attributed to the ablutions, exercise and diet to which in such circumstances the patients readily conform themselves as to the wet bandages, douches and other forms of hydropathic treatment.

Hydrophane (hī'dru-fān), a variety of opal, made transparent by immersion in water. See *Opal.*

Hydrophobia (hī-dru-fō'bi-a; Greek *hydōr*, water, and *phobos*, fear), a specific disease arising from the bite of a rabid animal. The animals most liable to be afflicted with madness are dogs; but cats, wolves, foxes, etc., are also subject to it. The early symptoms of rabies in the dog are such as restlessness and general uneasiness, irritability, sullenness and inclination for indigestible and unnatural food, and often a propensity to lap its own urine. As the disease proceeds the eyes become red, bright and fierce, with some degree of strabismus or squinting; twitchings occur round the eye, and gradually spread over the whole face. After the second day the dog usually begins to lose perfect control over the voluntary muscles. He catches at his food, and either bolts it almost unchewed, or, in the attempt to chew it, suffers it to drop from his mouth. The want of power over the muscles of the jaw, tongue and throat increases until the lower jaw becomes dependent, the tongue protrudes from the mouth, and is of a dark, and almost black color. A peculiar kind of delirium also comes on, and the animal snaps at imaginary objects. His thirst is excessive, although there is occasionally a want of power to lap. His desire to do mischief depends much on his previous disposition and habits. He utters also a peculiar howl, and his bark is altogether dissimilar from his usual tone. In the later stages of the disease a viscid saliva flows from his mouth, and his breathing is attended with a harsh, grating sound. The loss of power over the voluntary muscles extends, after the third day, throughout his whole frame, he staggers in his gait, and frequently falls. On the fourth or fifth day of the disease the dog dies, sometimes in convulsions, but more frequently without a struggle. In regard to man the rabid virus seems to be more violent when it proceeds from wolves than from dogs. It appears to be contained solely in the saliva of the animal, and does not produce any effect on the healthy skin. But if the skin is deprived of the epidermis, or if the virus is applied to a wound, the inoculation will take effect. The development of the rabid symptoms is rarely immediate; it usually takes place before the twenty-first day, but in some cases it has been reported as having occurred after six months or even longer. It begins with a slight pain in the scar of the bite, sometimes attended with a chill; the pain extends and reaches the base of the breast, if the bite was on the lower limbs, or the throat, if on the upper extremities. The patient becomes dejected, morose and taciturn. He prefers solitude, and avoids bright light; frightful dreams disturb his sleep; the eyes become brilliant; pains in the neck and throat ensue. These symptoms precede the rabid symptoms two or three days. They are followed by a general shuddering at the approach of any liquid or smooth body, attended with a sensation of oppression, deep sighs and convulsive starts, in which the muscular strength is much increased. A foamy, viscid saliva is discharged from the mouth; the deglutition of solid matters is difficult;

the respiration hard; the skin at first, chilly, and afterwards covered with sweat; the pulse weak; the fit is often followed by a syncope; the fits return at first every few hours, then at shorter intervals, and death takes place generally on the second or third day. No means have yet been found of arresting the progress of the poisonous virus after it has once developed in the system. The treatment, therefore, consists in preventing its development which may be effected by applying a ligature, where possible,



Section of Hydrostatic Press.

to impede the circulation from the wound, by sucking it, and thoroughly cauterizing it either with nitrate of silver or with iron heated to a white heat, the pain of cautery being less as the temperature is greater. If these means are not available, any burning substance and most acids may be used. M. Pasteur discovered a method of preventing the development of the disease by a system of successive inoculations with rabid virus of greater and greater intensity; the inoculation being made the first day with marrow extracted from a rabid animal 12 to 14 days previously, the second day with fresher marrow, continuing until marrow only one day old is used. The result of this treatment is claimed to confer immunity from infection. While this method has been favorably received, many doubt its efficacy, especially the anti-vaccinationists, and question the number of cures really performed. As a sharp critic of the Pasteur system has remarked, every one who is bitten and inoculated is counted in M. Pasteur's list, though there is nothing to prove that he would have contracted the disease.

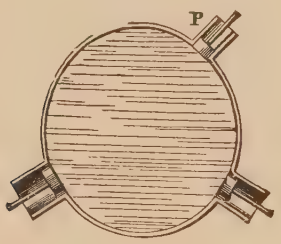
Hydrophora (hī-drof'or-a), one of the three divisions into which Huxley and other authors divide Hydrozoa.

Hydroplane (hī'drō-plān), a motor boat or launch with bottom built in one or more planes or steps sloping toward the stern, so that when the boat is driven at high speed it tends to rise and glide over the surface of the water. This plan of construction is best adapted to light racing boats.

Hydrostatic Press (hī-dru-stat'-ik), or Bramah's Press, a hydrostatic apparatus which in its practical application was invented by Bramah in 1796. It will be understood from the accompanying figure. By means of a suction and force pump, *a a*, worked by the lever or handle L turning about the point O, water is drawn from the reservoir B B and forced along the tube C C into the cistern V through the top of which a heavy metal plunger A A works. On the upper end of the plunger is a large plate B′ B′ upon which the goods to be pressed are placed. When water is pumped from the reservoir B B into the cistern V, the pressure exerted by the plunger of the pump is transmitted according to the well-known hydrostatic principle (see *Hydrostatics*) to the bottom of the plunger A, which accordingly rises and carries the objects placed on plate B′B′ up against the top of a fixed frame D D. It was the invention by Bramah of a water-tight leather collar surrounding the piston that made the use of the press practicable; before his invention not much power could be developed from the escape of the water round the piston. The collar consists of a leather ring bent so as to have a semicircular section (as seen in cut), so that the water passing between the piston and cylinder fills the concavity of the collar, and by pressure produces a packing which fits the tighter as the pressure on the piston increases. The hydrostatic press may be constructed to give pressures of two or three hundred tons, and is extensively employed where very great force is required, as in testing anchors or raising very heavy weights.

Hydrostatics, is that part of the general science of hy-

drodynamics that treats of the application of forces to fluids at rest. Among the chief principles of hydrostatics may be mentioned the following: (1) The intensity of pressure at any point of a fluid is the same in all directions; it is the same whether the surface that receives the pressure faces upwards, downwards, horizontally or obliquely. (2) When a fluid is confined, if the intensity of pressure in one part be increased, as by forcing in a piston or by any other means, an equal increase will be produced in the intensity of pressure at all other parts: in other words, pressure applied to any one part



Pascal's Principle.

is transmitted without any change in its intensity to all other parts. The diagram will aid in the understanding of this. If pressure is applied to P it will be transmitted in all directions through the liquid. If other openings are made, and if they are fitted with pistons, the pressure that must be applied to any piston equal in area to the area of P is equal to the pressure on P; and if the area of one of the other pistons is greater or less than the area of P, the pressure required to keep it in its place is proportionately greater than or less than the pressure that is applied to P. This principle, which is known as Pascal's principle from being distinctly formulated by him, is the most important in hydrostatics, and finds a practical application in the Hydrostatic, or Bramah's Press (see above). (3) Not only is pressure transmitted out to the surface or envelope of the liquid, but within the fluid itself the particles are all pressed together. When a solid is immersed in the liquid it is pressed at every point of its surface in the direction perpendicular to the surface at that point. (4) In every horizontal layer throughout the liquid the pressure per unit area is the same; and this is the case independently of the shape of any vessel in which the fluid may be contained. The pressure per unit area in any horizontal layer depends only on the height of the free surface of the liquid above the layer considered, and the specific gravity of the liquid; and it is equal to the weight of a column of the liquid of unit sectional area whose height is the height of the free surface. Hence whatever be the shape or size of several vessels, if all have the same area of base, and if in all the water stands at the same height, the pressure on each of the bases is the same. (5) When a solid is immersed either partially or wholly in a liquid a portion of the liquid is displaced. The solid is at the same time pressed at every point by the liquid. But the upward pressure on the solid is greater than the downward by an amount equivalent to the weight of the liquid displaced by the solid. Hence we obtain what is called the principle of Archimedes, namely, that a body immersed either wholly or partially in a fluid loses a portion of its weight equal to that of the fluid which it displaces. This principle is of great importance as regards the flotation of bodies, and the determination of specific gravity, etc. In regard to the sinking or floating of bodies three different cases may thus arise: First, the weight of the body may exceed the weight of the liquid it displaces, in which case the body sinks in the liquid; Second, the weight of the body may be less than that of the liquid displaced, in which case the body will not remain submerged unless forcibly held down, but will rise to the top and partly out of the liquid until the weight of the liquid displaced is equal to its own weight; Third, the weight of the body may be equal to the weight of the liquid displaced, in which case it will have little or no tendency either to sink or rise.

Hydrosulphuric Acid (hī-drō-sul-fū'rik), or sulphuretted hydrogen, or hydrothionic acid (H_2S), is a colorless, inflammable gas produced by the putrefaction of sulphurous organic matters. Many mineral waters contain it naturally. It may be artificially produced by burning sulphur vapor in hydrogen, or by passing hyrdogen through sulphur.

Hydrotherapy (hī-drō-thĕr'a-pi), the use of water in various ways for therapeutic purposes. Externally water is being used with great success in the treatment of insanity, fever, sciatica, insomnia, sepsis in wounds, etc. Internally water is also of great service, whether imbibed or injected.

Hydrothorax (hī-dro-thō'rakz), a dropsical condition of the pleura, in which the pleural cavity contains a serous fluid exuded from the blood-vessels, not due to inflammation.

Hydrozoa (hī-dru-zō′a), a class of animals of the subkingdom Cœlenterata, in which the walls of the body inclose a simple undivided cavity which acts both as a body cavity and a digestive cavity. The body is essentially

A, Part of the colony of *Bougainvillea muscus*, one of the compound *Hydrozoa*, of the natural size. B, Part of the same enlarged: *p*, A polypite fully expanded; *m*, An incompletely developed reproductive bud; *m′*, A more completely developed reproductive bud; *f*, Cœnosarc withits investing periderm and central canal. C, A free reproductive bud or medusiform gonophore of the same: *n*, Gonocalyx; *p*, Manufrium; *c*, One of the radiating gastrovascular canals; *o*, Ocellus; *v*, Velum; *t*, Tentacle. (After Allman.)

composed of two layers, an outer layer or ectoderm and an inner or entoderm. Reproductive organs are developed as external processes of the body-wall, but reproduction also takes place by fission. The Hydrozoa are all aquatic and almost all marine. The fresh-water hydra is a very good type of the class. The body is quite soft, and when fully contracted appears like a particle of matter resting on the surface of a plant or stone; but when expanded it shows a long slender body of a bright green or light brown color. One end of the body develops into a number of long slender tentacles, within which, near their bases, the mouth of the animal is found. This is the *distal* or free-growing end. The other and more slowly growing end is known as the *proximal*, and ends in a kind of disc or foot by which the hydra attaches itself to objects. The body is hollow from one end to the other. It is found most in semistagnant waters, where, hanging from its foot-disc, with its long tentacles expanded, it seizes on the small crustaceans or other suitable prey which comes in contact with it. Its tentacles have a stinging power which soon paralyzes its prey. Under favorable conditions one or more hydræ are usually found attached to the parent form. Such are produced by a process of budding from the parent. Each of these ultimately separates from the parent stem and becomes an independent hydra. The Hydrozoa are divided by Prof. Nicholson into six subclasses, viz., the Hydroida, the Siphonophora, the Lucernarida, the Graptolitoidea, the Hydrocorallinæ and the Stromatoporoidea.

Hyena (hī-ē′na), a genus of digitigrade carnivorous quadrupeds, constituting a family which unites the skull characters of the Felidæ (cats) with the skeleton and gregarious habits of the Canidæ (dogs). The characters of this genus are five molars above, and five or four below, on each side, the three anterior molars being conical, smooth, and remarkably large, adapted for breaking the bones of their prey; the tongue is rough; the legs are each terminated by four claws; the forelegs are longer than the hind legs; the eyes large and prominent; the ears long and acute; the jaws are remarkable for the strength of their muscles, and can crush the hardest and most massive bones with ease. The genus is confined to Africa and Asia. There are three species known—the striped hyena (*Hyaena striata*), whose general color is a grayish-brown, diversified with blackish stripes, which run along the ribs, and upon the limbs, these peculiar marks distinguishing it from the other species; the spotted hyena (*Hyaena crocuta*), so named on account of the well-defined spots that are scattered over its body and limbs; and the brown hyena (*Hyaena brunnea*), whose fur is of a blackish-brown tint, diversified with a lighter color around the neck. The term 'laughing hyena' is applied to the spotted hyena which utters strange sounds that resemble hysterical laughter. This animal is also called the tiger wolf.

They are extremely voracious, feeding chiefly on carrion, and thus being of great utility in the countries where they live; to obtain dead bodies they will even dig up graves. Along with the true hyenas, the aardwolf of South Africa is also included in the family of Hyænidæ. An

extinct species, the *cave hyena* (*H. spelæa*) was abundant in England, France and Germany anterior to the glacial epoch, and has left its remains in many caves of these countries.

Hyères (ē-âr), a town of Southern France, department Var, 10 miles east of Toulon, beautifully situated on a declivity facing the Mediterranean. It is much frequented by patients suffering from chest or nervous disorders. Pop. (1906) 17,790.

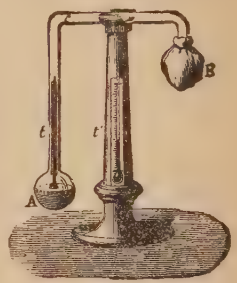
Hyères Islands, a group of islands in the Mediterranean, on the coast of France a little south of Hyères. Pop. 5755.

Hygieia (hī-ji-ē'ya), the Greek goddess of health, daughter of Asclepios, or Æsculapius. Her temple was placed near that of Æsculapius, and her statues were even erected in it. She is represented as a blooming maid with a bowl in her hand, from which she is feeding a snake, the symbol of health.

Hygieia, from antique statue.

Hygiene (hī'ji-ēn), the department of medicine which treats of the preservation of health, and the duration of life prolonged by a due attention to physiological or natural laws. It is usually divided into public and private hygiene, the former having to do with measures for excluding causes of disease (see *Quarantine* and *Vaccination*), methods of securing cleanliness in the streets and dwellings (see *Sanitation* and *Sewage*), methods of maintaining the purity of the supply of food and drink (see *Adulteration*); the latter may be considered to embrace such subjects as alimentation (see *Aliment*, *Digestion* and *Dietetics*), clothing (see *Clothing*), exercise and muscular development (see *Gymnastics*), etc.

Hygrometer (hī-grom'e-tẽr), an instrument for measuring the degree of moisture of the atmosphere. The chief classes of hygrometers depend either upon absorption or upon condensation. Of the former kind is the hygrometer of Saussure, in which a hair, that expands and contracts in length according as the air is more or less moist, is made to move an index. Of the latter sort is Daniell's hygrometer. This instrument consists of a bent glass tube, terminating in two bulbs, the bulb A being two-thirds filled with sulphuric ether, and the bulb B being, at the commencement of an experiment, empty. The latter is covered with muslin. In process of construction the tube is exhausted of air, and is thus filled with vapor of ether through its entire length. A thermometer (*t*) whose bulb is immersed in the ether of the lower arm, is inserted in the tube to register variation of temperature, and a second thermometer (*t'*) is attached to the stand of the instrument, to show the temperature of the outer air. If sulphuric ether be dropped on the bulb B, as it evaporates the bulb is cooled, and the vapor of ether is condensed within it from the bulb A; while owing to the evaporation from A into B the temperature of the former gradually falls. The operation is carried on till the temperature of A is so far reduced that dew from the surrounding air just begins to condense upon it. By means of the thermometer contained in A the temperature is read off at the instant at which vapor begins to condense, and the dew-point is thus obtained. The *hygrometric condition*, that is, the ratio between the quantity of moisture that the air actually contains and the quantity which it is capable of containing at the existing temperature, is then easily deduced. Regnault's hygrometer is a modification of the principle of Daniell's instrument, the ether being evaporated by forcing air through it.



Daniell's Hygrometer.

Hykshos. See *Hyesos.*

Hylæosaurus (hī-lē-o-sạ'rus), a gigantic fossil lizard discovered in the Wealden formation of Tilgate Forest, England. Its probable length was about 25 feet. It is one of the Ornithoscelida, the group which presents a structure intermediate between that of existing birds and reptiles.

Hymen (hī'men), Hymenæus, the god of marriage in Greek mythology. No marriage took place without his being invoked to sanction it. He is described as having around his brows the flowers of marjoram, in his left hand the flame-colored nuptial veil, in his right

the nuptial torch, and on his feet golden sandals. He is a taller and more serious Eros, and is accompanied by song and dance.

Hymenoptera (hī-men-op'tĕr-a; Gr. *hymēn*, a membrane, and *petron*, a wing), an extensive order of insects, comprising bees, wasps, ants, ichneumon-flies, gall-flies and allied insects. They are characterized by four membranous naked wings which have comparatively few veins. The second pair of wings is always smaller than the first. The mouth parts are provided with biting jaws and a suctorial organ. The head is freely movable, and besides the lateral compound eyes there are usually

Hymenoptera. *a*, Winged male of ant; *b*, wingless worker of ant; *c*, Pupa of ant; *d*, larva of ant enlarged; *e*, the great sawfly (*Sirex gigas*).

three ocelli on the top of the head. The Hymenoptera undergo complete metamorphosis. Females have the extremity of the abdomen furnished either with an ovipositor, forming a boring organ (*terebra*), or a sting (*aculeus*). Hence the two suborders into which Hymenoptera are divided: *Terebrantia*, comprising the sawflies, gall-flies, ichneumon-flies, etc., and the *Aculeāta*, which include the bees, wasps, ants, hornets, etc.

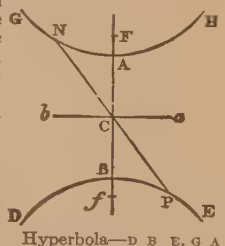
Hymettus (hī-met'us), a mountain in Attica, now called *Trelovouni*, southeast of Athens, distinguished among the ancients for the excellence of its marble and its honey. The latter is still in repute.

Hymn (him), originally a song of praise sung in honor of gods and heroes on festivals, with the accompaniments of music and dancing. Among the Hindus the hymns of the Rig-Veda, among the Hebrews the psalms, and among the Greeks the so-called Orphic and Homeric hymns are good examples. The early Christian hymns are full of devotional feeling. Their use dates from the first days of the church; but the names of the authors even of the more modern hymns cannot be discovered with certainty, though Prudentius, Paulus Diaconus and Thomas Aquinas are known to have composed some of the most esteemed. The use of hymns was sanctioned by the fourth council, at Toledo, in 633. Several of them have names derived from the words with which they begin, as the *Te Deum*, the *Gloria Patri*, etc.

Hyoid Bone (hī'oid), in anatomy, a bone shaped somewhat like the letter U, but with a wide bend and shorter limbs in proportion to the body, and having two pairs of upward projections or *cornua* (horns). It is suspended horizontally in the substance of the soft parts of the neck between the root of the tongue and the larynx.

Hyoscyamus (hī-os-sī'a-mus). See *Henbane*.

Hypatia (hī-pā'she-a), a Greek female philosopher of the eclectic school, the daughter of Theon, a celebrated astronomer and mathematician of Alexandria towards the close of the fourth century after Christ, at which period she was born. Her father taught her not only all the branches of polite learning, but also geometry, astronomy and finally philosophy. She acquired a great reputation in the latter study, and as a preceptress in the school of Plotinus gathered a numerous auditory of students from all parts of the East. She was as virtuous and beautiful as she was learned. But the zeal and the opposition of Cyril, the Patriarch of Alexandria, were aroused at the influence exercised by Hypatia; the lower and more ignorant clergy in particular were stirred against her, and at length a number of them having excited a popular tumult, seized her as she was returning from the schools, dragged her through the streets of Alexandria, stripped her naked, and finally murdered her with circumstances of the greatest barbarity (415). Charles Kingsley chose the story of Hypatia as the subject of an interesting historical romance.



Hyperbola—D B E, G A H, are opposite hyperbolas; F, *f*, foci; C, center; A B, transverse axis; *a b*, conjugate axis; N C P, a diameter.

Hyperæmia (hī-per-ē'mi-a), an excessive flow of blood to any structure of the body.

Hyperbola (hī-pĕr'bo-la), in geometry, a curve formed by

cutting a cone in a direction parallel to its axis, or so that the cutting plane makes a greater angle with the base than the side of the cone makes, and when produced cuts also the opposite cone, or the cone which is the continuation of the former, on the opposite side of the vertex, thus producing another hyperbola, which is called the opposite hyperbola to the former one.

Hyperbole (-bo-lē), a rhetorical figure, in which an idea is expressed with a fanciful exaggeration of phrase which is not to be taken too literally, but only as representing a certain warmth of admiration or emphasis. 'His fame reaches to the stars' is an example of hyperbole.

Hyperboreans (hī-per-bo-rē'anz), an ancient name for a mythical people, supposed to dwell in the extreme north of the earth. They were favorites of Apollo, and dwelt in an earthly paradise in everlasting youth and health. In modern times the term is applied to certain trees of Northeast Asia and Northern America.

Hyperdulia. See *Dulia.*

Hypericaceæ (hī-per-i-kā'se-ē), HYPERICI'NÆ, a nat. order of plants, of which the genus *Hypericum* or St. John's wort is the type. They are herbs, shrubs, or (rarely) trees, with simple, opposite (rarely whorled) leaves. They have terminal or axillary, solitary, cymose or paniculate flowers, usually yellow or white. These plants are much spread; they abound in resinous juice, and many possess medicinal properties.

Hyperæsthesia (hī-per-ēz-thē'si-a), a word indicating an excessive sensibility of the nerves of sensation, special or general. In this condition the slightest stimulus may cause a paroxysm of pain, as in ticdouloureux. In the case of the spinal nerves, bright flashes of light may be seen, sounds heard, and smells and tastes experienced with no apparent cause. Hysteria is the disease most likely to bring on this condition, but it is sometimes induced by rheumatism, gout, skin diseases, etc., and often adds to the distress in the early stages of various fevers.

Hyperides (hī-pėr-ī'dēz), an Athenian orator, the pupil of Plato and Isocrates, born about 400 B.C. Along with Demosthenes and Lycurgus he was one of the leaders of the patriotic and anti-Macedonian party. As an orator he was especially distinguished for his grace and subtlety of expression, as well as for his tact in handling the question under consideration. He was murdered at Ægina by the emissaries of Antipater in 322 B.C. Of his orations one has reached us nearly entire; the others only in fragments.

Hyperion (hī-pėr-ī'on or hī-pē'ri-on), in the most ancient mythology of Greece, the god of the sun, afterwards identified with Apollo; also one of the Titans.

Hypersthene (hī'pėr-sthēn), a mineral of a color between grayish and greenish black, but nearly copper-red on the cleavage. It was first found on the coast of Labrador, and was called Labrador hornblende.

Hypertrophy (hī-per'tru-fē), literally over-nourishment, is an excessive development of the body or any of its organs by actual increase of the particular parts composing it, as increase of muscular fibre in the heart. It arises from continued oversupply of blood to the part, due it may be to chronic irritation of the part, as for example thickening of the skin in the neighborhood of a chronic ulcer; or it may be due to excessive use of the part. The cure of hypertrophy is attended with difficulty. The diseased organ must be kept at rest if possible.

Hyphomycetes. See *Fungi.*

Hypnotism. See *Mesmerism.*

Hypnum (hip'num), one of the largest genera of mosses, including above ninety species, natives of Britain. Many of the species are very large and ornamental.

Hypocaust (hip'o-kąst), in ancient baths, etc., an arched chamber in which a fire was kindled for the purpose of giving heat to the rooms above it. The heat was distributed by means of tubes of earthenware.

Hypochlorites (hī-pu-klor'itz), salts, chiefly important as powerful oxidizing and bleaching agents; not, however, when pure, but when containing chlorides. The chief hypochlorites, or at least the complex substances which contain hypochlorites, are bleaching-powder, and the bleaching liquors made with potash and soda.

Hypochondria (hip-u-kon'dri-a), a disorder arising from a disturbance of the functions of the nervous system. It is a form of melancholia. The sufferer lives under the generally groundless apprehension of different diseases. Uninterruptedly occupied with the state of his body he takes notice of every feeling, and wishes to have every trifling pain explained, considering every one as a symptom of a serious disease.

For everything he wants physic. Hypochondria is, physically considered, not a dangerous disease, although it makes the life of the sufferer a torment to himself and his friends. It is occasioned mainly by too great mental exertion, by too sedentary a life, by sexual indulgence or excess in exciting liquors; and also by want of exercise of the physical and mental powers producing ennui. It can be cured, but slowly, by the avoidance of the habits likely to occasion it, by the adoption of a steady and regular life, with moderate exercise for the mind and body, and by the frequent enjoyment of cheerful society.

Hypodermic Injections (hī-pu-dĕr'-mik), injections of some substance beneath the skin; a method adopted in medicine when the condition of the stomach or other organs renders the use of drugs by the mouth objectionable, or when rapidity of action is desired. The medicine is introduced by a small glass or metal syringe fitted with a long hollow, needle-shaped point of steel, which is thrust through the skin.

Hypophosphites (hī-pu-fos'fīts), salts of hypophosphorous acid, especially certain medicinal salts, chiefly the hypophosphites of potassium, sodium and calcium. They have been used with considerable advantage in disorders of the blood and the digestive organs, and have also been found of benefit in consumption, although failing to effect a cure.

Hyposulphites (hī-pu-sul'fīts), salts of hyposulphurous acid. Among the most important are the hyposulphites of sodium and calcium, the former of which is used in medicine as an external remedy in parasitic skin disorders and an internal one in checking fermentation in zymotic diseases. It is variously used in bleaching, photography, and other arts as an antichlore, a dissolvent of bromide and iodide of silver, etc.

Hypotenuse (hī-pot'e-nūs) in geometry, the longest side in a right angled triangle, namely that one which subtends or is opposite to the right angle. One of the most important propositions of Euclid's *Elements* is the forty-seventh of the first book, discovered by Pythagoras, which proves that the square described on the hypotenuse is equal to the sum of the squares described on the other two sides.

a b, Hypotenuse.

Hypothecation (hī-poth-e-kā'shun), the act of assigning something in security without giving up the possession of it. See *Bottomry*.

Hypothesis (hī-poth'e-sis), etymologically a supposition; is popularly used to denote something not proved, but assumed for the sake of argument. In scientific and philosophical usage it denotes either a probable theory of phenomena not yet fully explained, or a strictly scientific theory which accounts for all the known facts of the case, and which only needs the verification of subsequent observations and deductions to become a certainty. Thus the conjecture of Newton that the force of gravity, as exemplified on the earth, might extend to the moon, was in its first stage a probable hypothesis; but when it was found to account for all the facts, it became a scientific hypothesis or theory. The word theory is frequently used where hypothesis should be employed.

Hypsiprymnus. See *Kangaroo-rat*.

Hypsometry (hip-som'e-tri), the measurement of heights. See *Heights*.

Hyracotherium (hī-ra-ku-ther'i-um), a genus of fossil Pachydermata, belonging to the odd-toed division, intermediate between the hog and the hyrax, occurring in the tertiary strata of England. The species are of the size of a hare.

Hyrax (hī'rakz), a genus of pachydermatous mammalia, intermediate in their character between the rhinoceros and the tapir. It is the only genus of the order Hyracoidea, characterized by having no canine teeth, but long, curved incisors. The front feet have four toes, and the hind feet three. The Cape hyrax is by the colonists of South Africa called *Rock-badger* and *Rock-rabbit*.

Hyrcania (hĕr-kā'ni-a), a province of ancient Asia, corresponding to what are now the northern parts of Khorasan and Mazanderan, along the Caspian Sea.

Hyrcanus (her-kā'nus), the name of two Jewish high-priests and rulers of the Asmonean family; —John Hyrcanus, the son and successor of Simon Maccabæus, assumed the title of prince and the high priest in 137 B.C., freed Judæa from the yoke of the Syrians, and founded a dynasty of rulers which lasted till the accession of Herod. He also subjugated the Samaritans and Idumæans. He died in 105 B.C., leaving five sons, two of whom, Aristobulus and Alexander, afterwards governed with the

title of kings.—John Hyrcanus II, grandson of former, became king, but was ousted by his brother Aristobulus. Taken by the Parthians to Seleucia, he returned to Jerusalem, on invitation of Herod, son of Antipater, but was put to death, B. C. 30, for plotting against Herod.

Hyslop (his'lop), JAMES HERVEY (1854-1920), director of research of the American Society for Psychical Research. Born at Xenia, Ohio. Author of many psychical works.

Hyssop (his'up; *Hyssōpus*), a genus of plants of the nat. order Labiatæ. The common hyssop (*Hyssōpus officinālis*) is a perennial shrubby plant rising to the height of 2 feet, a native of Siberia and the mountainous parts of Austria, but common in our gardens. It flowers from June to September. The leaves have an agreeable aromatic odor, and a slightly bitter and somewhat warm taste. It was once esteemed as a medicine, but has now fallen into disuse. The hyssop of Scripture (the symbol of spiritual purification from sin) is generally identified with the caper (*Căppăris spinōsa*).

Hyssop (*H. officinālis*).

Hysteria (his-tē'ri-a), a nervous affection to which women are subject, generally occurring in paroxysms, characterized by alternate fits of laughing and crying, convulsive struggling alternately remitting and exacerbating, sense of suffocation, palpitation of the heart, the sensation of a ball ascending from the pit of the stomach, occasioning a feeling of strangulation (*globus hystericus*), etc. Women of a delicate habit, and whose nervous system is extremely sensitive, are the most subject to hysterical affections; and the habit which predisposes to these attacks is acquired by inactivity and a sedentary life, grief, anxiety and various physical disorders. They are readily excited, in those who are subject to them, by strong emotions, especially if sudden. Hysterical complaints are best prevented by a judicious care of the moral and physical education of girls. Men are sometimes, but rarely, subject to disorders not essentially different.

Hythe (hīth), a borough of England, one of the Cinque Ports, in the County of Kent, 11 miles W. S. W. of Dover, to the west of Folkestone, at the foot of a steep hill or cliff. It was anciently a place of great importance; but its harbor has been entirely silted up. It has become a fashionable resort for sea-bathing, and there is here a government school of musketry. A promenade over five miles along the coast was opened in 1881. Pop. (1911) 6387.

I

I, the ninth letter and the third vowel of the English alphabet, in which it represents not only several vowel sounds but also the consonantal sound of *y*. The two principal sounds represented by it in English are the short sound as in *pit, pin, fin,* and the long as in *pine, fine, wine,* the latter being really a diphthongal sound. It has also three other sounds, viz., that heard in *first, dirk* (ė, the neutral vowel); that heard in *machine, intrigue* (which, however, can scarcely be considered a modern English sound); and the consonant sound heard in many words when it precedes a vowel, as in *million, opinion, trunion.* I and J were formerly regarded as one character.

Iamblichus (ī-am'bli-kus), a Greek Neo-Platonic philosopher, a native of Chalcis in Cœle-Syria, who flourished in the beginning of the fourth century after Christ. He was the pupil of Porphyry, and having become perfect in the doctrines of the Plotinian school, he taught with vast reputation. His school produced many eclectic philosophers, who were dispersed throughout the Roman Empire. His philosophical works now extant are: a *Life of Pythagoras;* an *Exhortation to the Study of Philosophy; Three Books on Mathematical Learning;* a *Commentary upon Nicomachus' Institutes of Arithmetic;* and a *Treatise on the Mysteries of the Egyptians, Chaldeans, and Assyrians.* He died at Alexandria about 333.

Iambus (ī-am'bus), in prosody, a foot of two syllables, a short and long one (⏑ —), or an unaccented syllable followed by an accented one. The iambic meter is the fundamental rhythm of many English verses. The verse of five iambic feet is a favorite meter, being the heroic verse of English, German, and Italian poetry.

Ianthina (i-an'thi-na; Gr. *ianthinos,* violet-colored), a genus of oceanic gasteropodous mollusca, with a thin, violet-colored, snail-like shell. When irritated they pour out a violet secretion, which colors the surrounding water and serves for their concealment, in the same manner as the ink of the cuttle-fish.

Ibadan (ē-bä'dan), a town of Western Africa, in the Yoruba country, about 70 miles north of the Bight of Benin. Pop. said to be about 150,000, a few of them whites.

Ibague (ē-bä-gä'), a town of South America, Republic of Colombia, department of Tolima. Pop. (1912) 23,607.

Ibañez (ē-bä'nyez; Spanish pron. ē-bä'nyāth), VICENTE BLASCO, a Spanish novelist (1867-), born at Valencia, Spain. His first novel to attain popularity in America was *Four Horsemen of the Apocalypse.* This was followed by *Mare Nostrum* and others.

Ibarra (ē-bär'rä), a town of Ecuador, 60 miles north of Quito. Pop. estimated at 10,000.

Iberia (i-bē'ri-a), in ancient geography:—(1) A fertile district in Asia, between the Euxine and Caspian Seas, a part of modern Georgia. (2) An ancient name of Spain.

Iberis (ī-bē'ris), a genus of cruciferous plants, of which several species are cultivated in gardens under the name of *candytuft.*

Iberville (ē-bar-vēl), PIERRE LE MOYNE SIEUR D', a French-Canadian soldier and naval officer, founder of Louisiana, born in Montreal in 1661; died in 1706. He saw much service with the French during their earlier struggles with the English, being in the expedition which won Fort Nelson (1686), the invasion of Newfoundland and the naval fights of 1697 in Hudson Bay. Sent to establish a French post at the mouth of the Mississippi, he founded Biloxi, Miss., in 1699, and subsequently a post on Mobile Bay and another on Dauphin Island.

Ibex (ī'beks), a name of several species of goats. The horns of the male are flattened, have two longitudinal ridges at the sides, and are crossed by numerous transverse knots. The best-known varieties are the *Capra ibex* of the Alps and Apennines, and the *C. Siberica,* the bearded ibex of the Himalayas. Another

species, *C. ægagrus*, inhabits the lofty rocky peaks of Mount Caucasus. Some writers say that the enormous horns of the ibex are employed by their owner as buffers, by which the force of a fall may be broken, and that the animal, when leaping from a great height, will alight on its horns, and by their elastic strength be guarded from the severity of a shock that would be fatal to other animals. The ibex has remarkable powers of endurance, being capable of sustaining life without food or water for a very long time. The color of the ibex is a reddish-brown in summer, and gray-brown in winter. There is a darker stripe along the spine and over the face. They are exceedingly wary, and difficult game for the hunter because of the nature of the country where they roam and their capacity to escape by way of the steepest precipices, impossible for man.

Ibicui (ib'i-kwi), a river of Brazil, which rises in the Serra de Santa Anna, province of Rio Grande do Sul, and joins the Uruguay at Yapeyu after a course of 400 miles.

Ibigau (ib'i-gą; *Nyctibus grandis*), a very large goat-sucker inhabiting South America; sometimes called the *grand goat-sucker*.

Ibis (ī'bis), a genus of birds allied to the storks, the most remarkable species being the *Ibis religiōsa*, or sacred ibis (also called *Threskiornis religiōsa*). This is found throughout Africa. It is about the size of a common fowl, with head and neck bare, and white plumage, the primaries of the wings being tipped with black and the secondaries being bright black, glossed with green and violet. It was reared in the temples of ancient Egypt with a degree of respect bordering on adoration, and after death was preserved in a mummified condition. The cause of its being deemed sacred was no doubt because it appeared in Egypt with the rise of the Nile; but it is now rare in that country, living farther south. There are several other species, as the *I. falcinellus*, or glossy ibis, nearly two feet in length, which builds in Asia, but migrates also to Egypt, sometimes visiting England; the *I. rubra* of tropical America, remarkable for its scarlet plumage; the *I. alba*, or white ibis of Florida; the *I.* or *Geronticus spinicollis*, or straw-necked ibis of Australia, etc.

Ibn-Batuta (ib'n ba-tū'ta), an Arabic traveler, born at Tangiers 1304; died at Fez 1377. He visited Egypt, Syria, Arabia, Persia, Central Asia, India, China, the Eastern Archipelago, East Africa, Central Africa, etc., and wrote an account of his travels.

Ibn-Ezra. Same as *Aben-Ezra*.

Ibrahim (ib'ra-him), the Arabic form of *Abraham*, and the name of many sultans and grand-viziers distinguished in Ottoman history.

Ibrahim Pasha, an adopted son of Mehemet Ali, viceroy of Egypt, born in 1789. He first gave signal proofs of his courage and military talents in the war with the Wahabs of Arabia, whom he completely defeated, and in the subjugation of Sennaar and Darfur. In 1825 he invaded the Morea at the head of an Egyptian army, with the view of conquering Greece for his father; but in 1828, in consequence of the interference of the great powers, was obliged to abandon the attempt. To effect his father's purpose of making Syria a bulwark to his new Egypto-Cretan kingdom he, in 1831, crossed the Egyptian frontiers with an army, overran Palestine, took St. Jean d'Acre by storm and made himself master of all Syria. The campaign terminated by an arrangement in which the Porte ceded Syria, and conferred the pashalic of Adana, by a kind of lease, personally on Ibrahim. In no long time war with the sultan again broke out, and resulted in a great defeat of the Turkish forces at Nizib in 1839. By the interference of the great powers Ibrahim was eventually obliged, after retiring from all his Syrian conquests, to return to Egypt, marching across the desert from Damascus with great loss and suffering. From this time he appeared seldom in public life, and employed himself chiefly in the improvement of his own estates. In 1846 he visited England and France. In 1848 Ibrahim, after his father had become superannuated, proceeded to Constantinople, and was nominated Viceroy of Egypt, but he died in the same year at Cairo, while Mehemet Ali was still alive. He was succeeded by Abbas Pasha, the favorite grandson of Mehemet Ali.

Ibrail. See *Brăila*.

Ibsen (ib'sen), Henrik, a Norwegian dramatist and lyric poet, born in 1828. His first play, *Catilina*, was produced in Christiania in 1850. This was an ill-written production, but his *Warriors in Helgeland* (1850), and *Rival Kings* (1864), raised him to the first rank among the national dramatists of Scandinavia, and *Love's Comedy* (1862) was the first step towards his satirical social dramas. He was successively director of the theater at Bergen and of the Norske Theatre at Christiania, which he managed in 1857-62. In 1864

he left his native country and thereafter resided chiefly abroad. His dramas are partly in prose, partly in verse, and include historical plays and satirical comedies of modern life. Some of them have been rendered on the English and American stage and are very highly regarded as literary and dramatic productions. The first to attract world-wide attention was *A Doll's House* (1879). This was followed by *Ghosts*, *The Wild Duck*, *The Master Builder*, and others, psychological in their interest, but vividly realistic in language, some of them giving rise to a storm of controversy. Ibsen was also a lyric poet. He obtained a pension from the Storthing. He died in 1906.

Ibycus (ib'i-kus), a Greek lyric poet born at Rhegium, Italy, in the sixth century B.C.; lived mostly at Samos in the court of Polycrates. It is related that while on a journey he was surprised and murdered by robbers near Corinth. Finding escape impossible, he declared that the cranes which happened to be flying over their heads would avenge his death. The robbers afterwards seeing a flock of cranes, one of them said involuntarily, 'Behold the avengers of Ibycus.' They were in consequence seized, and, after confessing their crime, were executed. His writings are known only by fragments. His poetry was chiefly erotic, but sometimes mythical and heroic.

Ica (ē'ka), a coast department of Peru, area, about 8700 sq. miles; pop. 100,000.—Its capital, Ica, lies in the fruitful valley of the river Ica; pop. 9000.

Icarus (ik'a-rus). See *Dædalus*.

Ice (īs), water frozen into a solid mass. Water freezes when its temperature is reduced below a certain point, which is by universal consent made a fixed point on thermometers. That point is called zero on the Centigrade and Réaumur scales, and 32° on the Fahrenheit scale. Water near the freezing point presents the curious anomaly of expanding instead of contracting, as the cooling process goes on. At 4.1° Centigrade (39.4° Fahr.) water has its maximum density-point. At temperatures below 4.1° the volume of the water increases as the temperature falls, and decreases as the temperature rises; and at the moment of solidifying the volume of the mass suddenly increases to a very considerable extent, so that ice at the temperature of freezing is one-ninth greater in volume than the water from which it is formed is at 4.1°. It is on this account that water freezes at the top first, and that ice when frozen floats at the top of the water. The temperature at which pure water becomes ice is very nearly constant under ordinary circumstances; and it is this fact, along with the ease of procuring water at the freezing temperature, or rather ice at the point of liquefaction, that has caused the temperature to be adopted as one of the fixed points in thermometers. The freezing-point is, however, slightly influenced by pressure. Increase of pressure lowers it, and the removal of pressure raises it. Salt water requires a lower temperature to freeze it than fresh water, and in the process a large part of the salt is rejected. Hence water obtained from the melting of sea-ice is nearly fresh. If water is kept perfectly at rest it may be reduced in temperature far below the freezing-point without turning into ice; but particles of solid matter such as dust must also be kept from falling into it. The expansion of water on its conversion into ice often gives rise to the exhibition of very great force, and produces very remarkable effects in nature. Much of the disintegration observed in rocks and stones during or immediately after frost is due to it, water having entered into their pores and cavities and burst off particles by its expansion. Ice, though it is very hard and brittle, possesses the property of plasticity to a very remarkable degree, and can be moulded into any form by the application of pressure. The plasticity of ice is a property of very great importance. It was discovered by Forbes, who explained the motion of glaciers on it. (*See Glaciers.*) In nature ice appears in the greatest masses in the form of glaciers and icebergs, the latter being portions which have become detached from glaciers that extend down into the sea. Ice is now an article of considerable importance from a commercial point of view, large quantities of it being shipped to warm climates from countries where it is naturally produced in abundance in winter, as the United States or Norway. Ice can now be made cheaply by certain processes and apparatus (see *Refrigerating Machines*), and a very pure and excellent article is thus produced, and has to a considerable extent replaced natural ice for domestic and other use.

Icebergs (īs'bergz), large masses of ice which have become detached from the shores of the arctic regions, and float about in the ocean at the mercy of the winds and currents. They are in fact pieces of glaciers detached from the parent mass by the action of the sea and by their own accumulating

weight. They present the strangest and most picturesque forms, are sometimes miles in length, and rise to a height of perhaps 250 or 300 feet above the sea, the portion above water being calculated at about an eighth of the whole. Icebergs consist of clear, compact solid ice, with a bluish-green tint. Their cavities contain fresh water, from the melting of the ice. They are frequently encountered in the North Atlantic (of course in the southern seas as well), and have caused many a wreck. The ice that forms on the surface of the sea, called *field-ice*, is porous, incompact, and imperfectly transparent. The field-ice forms in winter and breaks up in summer. A small field is called a *floe;* one much broken up forms a *pack*.

Iceboat, ICE YACHT, a triangular wooden framework with broad end forward, mounted on three skates or runners, 3 feet long by 8 inches deep. The motive power is a large sail, fastened to a boom and yard, which may be over 30 feet long. Such boats, running on smooth ice before the wind, may attain an average speed of 30 or 40 miles an hour and sometimes reach over 60 miles. The Hudson River is a favorite field for this sport.

Ice Breaker, a powerful boat or ship, used to break the ice in rivers or harbors. All our large northern rivers use such boats to keep the channel open in the winter. The Great Lakes are kept open for navigation by this means. An ice-breaking boat employed on Mackinaw Strait has large screws at bow and stern, and breaks the ice by forcing the water up under pack-ice and throwing it up on both sides. Russia employs in the Gulf of Finland a powerful ice-breaking ship, the *Ernick*, which forces the water upward by aid of a screw, lifting and breaking the ice, which is then cast aside by the strong steel bow, leaving a broad open channel for other ships to follow.

Iceland (is'land), an island, nominally independent, lying between the North Atlantic and the Arctic Oceans, 250 miles from Greenland and about 600 miles west of Norway; greatest length, east to west, 300 miles; central breadth, about 200 miles; area with adjacent isles, 40,437 sq. miles. In shape it somewhat resembles a heart with its narrowest point turned south. The coast-line for a considerable extent on the southeast is almost unbroken, but in all other directions presents a continued succession of deep bays or fiords and jutting promontories, thus affording a number of natural harbors. The interior has generally a very wild and desolate appearance, being covered by lofty mountain masses of volcanic origin, many of them crowned with perpetual snow and ice, which, stretching down their sides into the intervening valleys, form immense glaciers. These icy mountains, which take the common name of Jökul, have their culminating point in Oräfajökul, which is situated near the southeast coast, and has a height of 6409 feet. Among the volcanoes the most celebrated is Mount Hecla, in the south, about 5000 feet high. Numerous hot springs or *geysers* are scattered throughout the island, but are found more especially in the southwest, to the northeast of Reikjavik. (See *Geysers.*) There are numerous lakes and rivers. The most valuable mineral product is sulphur, of which the supply appears to be inexhaustible; the other minerals deserving of notice are chalcedonies, rock-crystals, and the well-known double-refracting spar, for which the island has long been famous. There is a kind of brown coal which to some extent serves as fuel. The climate is mild for the latitude, but the summer is too cool and damp for agriculture to be carried on with much success. In the southern parts the longest day is twenty hours, and the shortest four, but in the most northern extremity the sun at midsummer continues above the horizon a whole week, and of course during a corresponding period in winter never rises. Vegetation is confined within narrow limits. Almost the only tree is the birch, which has a very stunted growth, the loftiest of them hardly exceeding 10 feet. There are various flowering plants, among which saxifrages, sedums, thrift or sea-pink, etc., are common. Heath and bilberry cover large stretches. Among mosses or lichens are the edible Iceland-moss (which see). Cole, potatoes, turnips, radishes, and similar roots thrive tolerably well. But by far the most valuable crop is grass, on which considerable numbers of live stock (sheep, cattle, ponies) are fed. The reindeer, though not introduced before 1770, has multiplied greatly and forms large herds in the interior; but they are of little importance economically. Wild-fowl, including the eider-duck whose down forms an important article of commerce, are abundant; the streams are well supplied with salmon, and on the coasts valuable fisheries of cod and herring are carried on. Manufactures are entirely domestic, and consist chiefly of coarse woolens, mittens, stockings, etc. The exports are wool, oil, fish, horses, feathers, worsted stockings and mittens sulphur, and Iceland moss.

Photo by "International"

ICE BOATING AT LONG BRANCH, NEW JERSEY

Taking a turn while going at a fast clip during one of the exciting races held by the Long Branch Ice Boat and Yacht Club

The inhabitants are of Scandinavian origin, and speak a Scandinavian dialect which still represents the old Norse or Norwegian in great purity. They are of Protestant religion. Iceland has a constitution and administration of its own, dating from 1874. There is an *Althing* or Parliament, which meets twice a year at Reikjavik, the capital, and consists of 36 members, of whom 30 are chosen by popular suffrage, and 6 nominated by the king. A minister for Iceland, nominated by the king, is at the head of the administration, but the highest local authority is vested in the governor.

Some of the settlements of Irish monks had been made in Iceland about the end of the eighth century, but the island received the greatest proportion of its population from Norway. In 870 Harald Haarfager had made himself supreme in Norway, and as he treated the landed proprietors oppressively, numbers left the country and went to Iceland. In the course of sixty years all the habitable parts of the coast were settled. A settled government was established, a sort of aristocratic republic, which lasted for several centuries. Christianity was introduced in 981, and adopted by law in 1000; and schools and two bishoprics, those of Holar and Skalholt, were established. The Latin language and the literature and learning of the West, introduced by Christianity, were all the more warmly received, because poetry and history had already been cultivated here more than elsewhere in the Germanic north. Previously to this time the Icelanders had discovered Greenland (983) and part of America (about 1000), and they were now led to make voyages and travels to Europe and the East. Politically and ecclesiastically the most flourishing period of Iceland was from the middle of the twelfth to the beginning of the thirteenth century. In 1264 Iceland was united with Norway, with which it passed to Denmark in 1280, remaining with the latter in 1814, when Norway was joined to Sweden. On December 1, 1918, Iceland became nominally a sovereign state, but is united to Denmark in the person of the Danish king.

The Icelandic language is the oldest of the Scandinavian group of tongues, and as it is believed to exhibit the Norse language nearly as it was spoken at the date of the colonization of Iceland, it is sometimes called *Old Norse*. It is rich in roots and grammatical forms, and soft and sonorous to the ear. Icelandic literature may be divided into an ancient period, extending to the fall of the republic, and a modern, extending from that date to the present time, the former being far the richest and most original. Poetry was early cultivated, and among the most important works in Icelandic literature is the collection of ancient heathen songs called the elder or poetic Edda. (See *Edda*.) Histories and romantic works, known by the name of Sagas, are numerous. Many of these are masterpieces of prose style, and are still read with delight by the people of Iceland. The early portion of the second period was barren of anything worth mention in the way of literature, nor can the modern period boast at all of works possessing the interest of those belonging to the ancient, though since the middle of the eighteenth century there is scarcely a department of literature in which Icelandic writers have not done something. Many of the most valuable foreign works have been translated into Icelandic, and even the poems of Milton are read at many a cottage fireside. Pop. 78,489.

Iceland Moss, *Cetrāria islandĭca*, a species of lichen found in Iceland and other northern parts of the world, and on mountains. It is used in medicine as a mucilaginous bitter, and in Iceland is collected as a nutritious article of diet. Boiled with milk or water it forms a jelly. Its bitterness may be removed by steeping.

Iceland Moss (*Cetraria islandica*).

Iceland Spar, the transparent variety of calcspar, a mineral noted for its property of exhibiting in a remarkable degree the double refraction of light.

Iceni (i-sē'ni), a warlike tribe of ancient Britain, occupying the modern counties of Suffolk and Norfolk. They fought against the Romans under their queen Boadicea.

Ice-plant (*Mesembryanthĕmum crystallĭnum*), a plant (order Mesembryaceæ) which has received the above appellation from the transparent vesicles which cover its whole surface, and have the appearance of granules of ice. It is easily grown as a half-hardy annual.

Ichang (ē-chäng'), a walled town, in the Chinese prov. of Hupei, stands on the Yang-tsze-kiang, 1000 m. from Shanghai at its mouth. In 1877 it was declared open to foreign trade. Pop. 35,000. Ichang is the transhipment port for cargo to and from Size-chuen. The imports are chiefly shirtings, lastings,

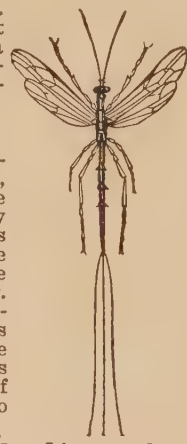
cloth, and the exports white wax, drugs, musk, tin, and silver in ingots.

Ichneumon (ik-nū'mun; *Herpestes*), a genus of digitigrade carnivorous animals belonging to the civet family. They have a long slender body, a sharp and pointed muzzle, and short legs. The most celebrated species,

Egyptian Ichneumon (*Herpestes Ichneumon*).

Herpestes Ichneumon, inhabits Egypt, where it is called *Pharaoh's rat*. It was adored by the ancient Egyptians on account of its antipathy to crocodiles, whose eggs it digs out of the sand and sucks. It is expert in seizing serpents by the neck so as to avoid any injury to itself. It is domesticated in Egypt, and more useful than a cat in destroying rats and mice. Their disadvantage, as domestic animals, is their predilection for poultry. The mongoose, or Indian ichneumon, is another species, not so large as the Egyptian, which it resembles in habits, being kept in many families as a useful domestic animal. It was introduced into Jamaica to kill the rats that infested the sugar plantations. This it effected, but has since become a nuisance from its ravages among the poultry of the island.

Ichneumon-flies, a large family of hymenopterous insects, which all agree in one particular, that they deposit their eggs either in or on the bodies, eggs, or larvæ of other insects. These apparently insignificant creatures confer inestimable benefits on man, as they destroy hosts of insects injurious to crops.



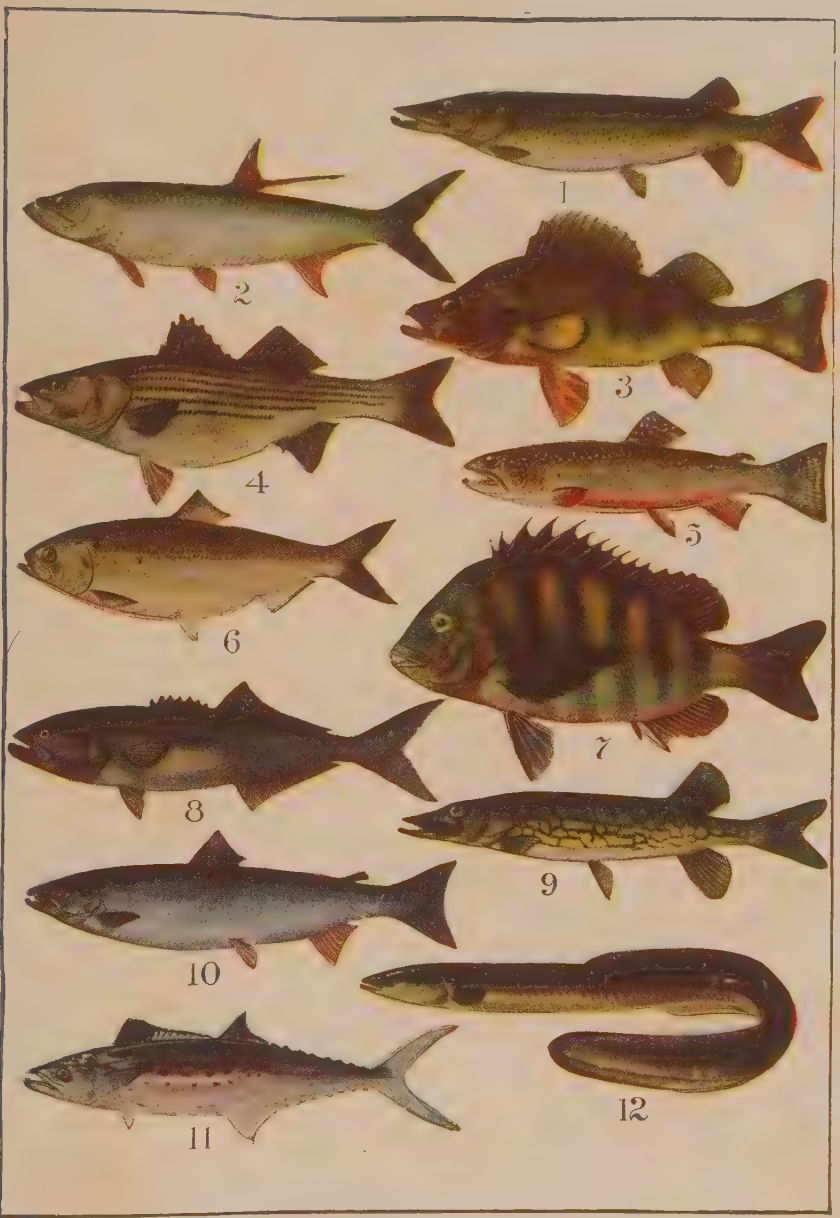
Ichneumon-fly (*Rhyssa persuasoria*).

Ichnology (ik-nol'-ō-ji), the name applied to the modern science of fossil footprints, or other impressions on rocks. The impressions are almost always found on rocks that have been deposited as mud; they are not so common in sandstone, yet they abound in the New Red Sandstone strata.

Ichthyol (ik-thi-ol), a dark red, oily liquid obtained from bituminous quartz rich in fossil fish. It is a useful antiseptic and is employed in the treatment of erysipelas, articular rheumatism, acne, eczema and other skin diseases.

Ichthyolite (ik'thi-u-līt), a petrified fish, or a stone with the impression of a fish.

Ichthyology (ik'thi-ol'ō-ji), that branch of zoölogy which treats of fishes. Fishes form the lowest of the five classes into which the great sub-kingdom Vertebrata is divided. They may be shortly described as vertebrate animals living in water and respiring the air therein contained by means of gills or branchiæ, having cold red blood, and a heart consisting of one auricle and one ventricle; and having those organs which take the form of limbs in the higher vertebrata represented by fins. Their bodies are generally covered with scales overlapping each other, and their usual form (though with much diversity) is lengthened, compressed laterally, and tapering toward both extremities. The scales of fishes assume various forms, which have been classed under the four types of *cycloid*, *ctenoid*, *ganoid*, and *placoid*. Cycloid scales are of a rounded form, and are those met with in the most familiar fishes. Ctenoid scales, like those of the perch, have spinous projections from their posterior margin. Ganoid scales are in the form of thick bony plates covered with a superficial layer of enamel. Placoid scales form detached masses of various shapes often provided with spines. The skeleton presents great variations from the amphioxus, in which the vertebræ are only foreshadowed, to the well-ossified skeleton of teleostean fishes. The vertebræ are biconcave or 'amphicœlous,' the opposed surfaces forming cups, and they vary in number from seventeen to more than 200. The spinal column is prolonged into the tail, which is two-lobed, the lobes either being equal (a *homocercal* tail) or unequal (*heterocercal*). The skull varies greatly; it may be ossified throughout as in the codfish, or the cartilaginous cranium may persist, as in the lamprey, sharks, and rays. The skull is small compared to the size of the animals themselves. The limbs, when present, are four in number. The anterior or first pair are called the *pectoral fins*. The *ventral fins*, or second pair of limbs, are variable in position, and not always present; they may be beneath the pectorals,



AMERICAN FRESH AND SALT WATER FISH

1. Muskellunge. 2. Tarpon. 3. Yellow perch. 4. Striped bass. 5. Brook trout. 6. Shad. 7. Sheepshead. 8. Blue fish. 9. Pickerel. 10. Land-locked salmon. 11. Spanish mackerel. 12. Common eel.

when they are *jugular;* behind the pectorals, when they are *thoracic*; or farther back, *abdominal.* The pelvis is represented by two triangular bones, which have no relation to the spinal column, and to which the fin-rays are directly attached. The median or vertical fins, that is, those situated on the back, are characteristic of fishes, and they may extend nearly from the head continuously to the anal aperture, as in eels; they may be broken up into several dorsals, caudal, and one or more anals, as in the cod; or the number of dorsals may be increased greatly, as in the mackerel. The fins may be wholly soft and flexible, or they may be in part rigid spines; or a series of soft fin-rays may be preceded by rigid and often formidable spines, which sometimes have a beautiful mechanism for elevation and depression. The teeth of fishes are generally very numerous, and may be placed on any part of the interior of the mouth, sometimes on the tongue. They are quite different in character from the mammalian teeth. The muscular pharynx and œsophagus lead into a stomach usually well defined, but sometimes only slightly differing in calibre from the intestine. The liver is proportionally large, and has usually a gall-bladder. The heart consists of a single auricle and ventricle, which is continued forwards by a dilated vessel called the *arterial bulb* (*bulbus arteriosus*). From this vessel the blood is sent right and left along the gills, which are the organs of respiration, and from the gills the aerated blood goes to the body. The gills or *branchiæ* are either free on one margin, as in ordinary fishes, or attached at both extremities. In the lepidosiren another structure appears, namely, lungs, which stretch through great part of the body and open on the posterior wall of the pharynx. A peculiar feature of fishes is the air-sac or swim-bladder, called also the *sound.* Anatomically its origin is identical with that of a lung; but it does not perform the function of a lung. It most probably represents an ancient lung-like organ which has degenerated, losing its original functions and assuming others. Its chief function at present is to serve as an aid in rising and sinking; but in some fishes it is prolonged so as to approach or even come in contact with the internal organs of hearing, perhaps acting as an organ of resonance. Reproduction is by ova or eggs, which in a few cases are retained in the body of the female until hatched. But the ova are usually fertilized outside the body, and the hatching process left to take place without aid. The eggs are, in most cases, in enormous numbers, as in the roe of the herring and salmon. Among the sharks the number is much less, and each ovum acquires, before exclusion, a horny sheath of various shape, but usually provided with cirri, by which it moors itself to some fixed object. In the pipe-fishes the male has a marsupium or pouch formed by folds of the abdominal integument, and in this pouch the eggs, transferred thither on exclusion, are hatched. The nervous system of fishes presents considerable variety. The amphioxus has no enlargement of the nervous trunk comparable to a brain; but in all the others the division into fore, mid, and hind brain is clearly marked. The olfactory organs are, in most cases, pits or sacs, on whose walls the olfactory filaments are spread out. The sense of taste seems less provided for, the tongue and palate being mostly firm, and often set with teeth. There is no external ear, and the internal apparatus is not wholly inclosed in bone, as in the higher vertebrates, but is partly free in the cavity of the skull. The eye is, in most cases, relatively large and flattened externally, the sight being keen. Special organs of touch are wanting for the most part, though the labial filaments, seen in the cod, whiting, mullet, and sturgeon, are of this nature. Among the most curious appliances with which fishes are provided, are the electrical apparatus that appear in some species, as in the torpedo or electric ray and the electric eel, both of which possess batteries capable of giving a shock of considerable power. Some fishes inhabit exclusively either fresh or salt water; others, as the salmon, migrate periodically from the one to the other.

Fishes may be roughly divided into two sections—the Chondropterygious or Cartilaginous fishes, having a cartilaginous or fibro-cartilaginous skeleton; and the Osseous or Bony fishes, having a bony skeleton. These two great divisions formed the basis of the classification of Cuvier. Agassiz proposed to divide fishes into four orders according to the character of their scales, viz., Ganoid, Placoid, Cycloid, Ctenoid, but this division has not been accepted.

The following divisions are now usually recognized:—

Order I.—Teleostei. Osseous or Bony Fishes, corresponding nearly to the Osseous fishes of Cuvier's classification. Characters: Skeleton more or less thoroughly ossified; two pairs of limbs usually present in the form of fins; gills free, comb-like, or tufted; usually cycloid or ctenoid scales. Sub-order I.—*Malacopteri.* Fishes with a complete set of fins supported by rays, all of which are soft.

as a rule. Examples: herring, pike, carp, salmon, eel, etc. Sub-order II.—*Anacanthini.* Fishes with fins entirely supported by soft rays; ventral fins wanting, or if present placed under the throat beneath or in advance of the pectoral fins. Examples: cod, haddock, ling, sole, turbot, and other flat-fishes. Sub-order III.—*Acanthopteri.* Fishes having one or more of the first rays of the fins in the form of spines; scales usually ctenoid; ventral fins beneath or in front of the pectorals. Examples: perch, gurnard, mackerel, mullet, etc. Sub-order IV.—*Plectognathi.* Body covered with ganoid plates, scales, or spines; ventral fins generally wanting. Examples: globe-fish, sun-fish, trigger-fish. Sub-order V.—*Lophobranchii.* Gills in the form of little tufts upon the branchial arches; scales ganoid. Examples: hippocampus, or sea-horse.

Order II.—Elasmobranchii. Characters: Skeleton cartilaginous; no bones in the head, the skull forming a cartilaginous box; gills forming a series of pouches; two pair of fins supported by cartilaginous fin-rays; skin covered by placoid growths of various kinds, as tubercles, spines, etc. Sub-order I.—*Holocephali.* Jaws bony and covered with broad plates representing the teeth; only one external gill-aperture, covered with a gill-cover. The chimæra or king of the herrings is an example. Sub-order II.— *Plagiostomi.* Mouth transverse (Gr. *plagios*, athwart) and on the under surface of the head; branchial sacs opening by several distinct apertures. Examples: sharks, rays, skate.

Order III.—Ganoidei. Characters: Body covered with ganoid plates, scales, or spines; skeleton partially ossified, the vertebral column being generally cartilaginous; skull with distinct cranial bones; usually two pairs of fins, the first rays of which are mostly in the form of spines; tail generally heterocercal. There are few living ganoid fishes, the great majority of them being found fossil. The best-known examples are the sturgeons.

Order IV.—Marsipobranchii. Characters: General form eel-like or serpentine; no paired fins to represent the limbs; only a median fin extending round the posterior extremity of the body; mouth circular and destitute of jaws proper; gills in the form of fixed pouches or sacs. Examples: lampreys and hag-fishes.

Order V.—Pharyngobranchii. The lancelet, the only example. Characters: No skull or distinct brain; no distinct heart; no vertebræ; no limbs; mouth a longitudinal fissure surrounded by filaments; walls of the pharnyx perforated by ciliated slits which serve as branchiæ.

Order VI.—Dipnoi. Represented by only a few fishes, as the mud-fish or lepidosiren and ceratodus. Characters: Body somewhat eel-like in form and covered with scales; pectoral and ventral limbs both present and filiform or sometimes paddle-shaped; both gills and lungs present. These animals form a connecting link between the fishes and the amphibia.

Ichthyopsida (ik-thi-op'si-da; Greek, *ichthys*, a fish, and *opsis*, appearance), one of the three great primary divisions of the Vertebrata (the others being Sauropsida and Mammalia), comprising the fishes and amphibia.

Ichthyornis (ik-thi-or'nis: Greek, *ichthys*, a fish, *ornis*, a bird), a fossil genus of carnivorous and probably aquatic birds, one of the earliest known American forms. It is so named from the character of the vertebræ, which, even in the cervical region, have their

Fig. 1, *Ichthyornis dispar*, restored. Fig. 2, Right jaw, inner view; half natural size.

articular faces biconcave as in fishes. It is also characterized by having teeth set in distinct sockets. Its wings were well developed, and the scapular arch and bones of the legs conformed closely to the true bird type.

Ichthyosaurus (ik-thi-u-sa'rus; Greek, *ichthys*, a fish, *sauros*, a lizard), an immense fossil marine saurian or reptile, having an organization combining the characters of saurian reptiles and of fishes with some of the peculiarities of the whales. The members of this genus had four broad feet or paddles enclosed in a single sheath of integument, and a long and powerful tail. Some of the largest of these reptiles must have exceeded 30 feet in length. Their remains range from the Lower Lias to the Chalk, and the great repository hitherto has been the Lias at Lynn Regis.

Ichthyosis (ik-thi-ō'sis), or Fish-skin Disease, a roughness and thickening of the skin, portions

IDAHO
Scale of Miles
0 10 20 40 60
Size of type indicates relative importance of places.
CANADA
MONTANA
WYOMING
NEVADA
UTAH
OREGON
WASHINGTON
Boundary Mts.
Selkirk Mts.
Cabinet Mts.
Bitterroot Mts.
Pot Mt.
Bald Mt.
Eagle Pk.
Seven Devils
Hump
Clearwater Mts.
Thunder Mt.
Vinegar Hill
Esters Peak
Cape Horn
Steel Mt.
Mt. Winthrop
Mountain Home
Reverse
Owyhee R.
Snake R.
Big Lost R.
Big Lost River Range
Lemhi Range
Lemhi Pass
Big Hole Pass
Big Hole R.
Bitterroot R.
Missouri R.
Clearwater R.
Salmon R.
Lochsa R.
Selway R.
Boise R.
Payette R.
Weiser R.
Owyhee R.
Bruneau R.
Malad R.
Portneuf R.
Blackfoot R.
Teton R.
Henrys Fork
Snake R.
Yellowstone R.
Gallatin R.
Madison R.
Gallatin Range
Centennial Mts.
Beaverhead Mts.
Lemhi Mts.
Lost River Range
Pioneer Mts.
Sawtooth Mts.
Smoky Mts.
Albion Mts.
Black Pine Mts.
Deep Creek Mts.
Raft River Mts.
Grouse Creek Mts.
Goose Creek Mts.
Bear River Range
Wasatch Mts.
Caribou Mts.
Aspen Range
Teton Range
Gros Ventre Range
Wind River Range
Absaroka Range
Gallatin Range
Madison Range
Tobacco Root Mts.
Big Belt Mts.
Little Belt Mts.
Crazy Mts.
Bridger Mts.
Flathead L.
Pend Oreille L.
Coeur d'Alene L.
Priest L.
Priest River
Kootenai R.
Clark Fork
Spokane R.
Snake R.
Bear Lake
Great Falls
Missoula
Helena
Butte
Anaconda
Deer Lodge
Boulder
Livingston
Bozeman
Gallatin
Virginia City
Dillon
Armstead
Redrock
Lemhi Pass
Big Hole Pass
Wisdom
Salmon
Leesburg
Yellowjacket
Lemhi Range
Lemhi R.
Salmon R.
Challis
Stanley
Sawtooth Mts.
Ketchum
Sun Valley
Hailey
Bellevue
Idaho Falls
Blackfoot
Pocatello
Chesterfield
Fort Hall
Fort Hall Indian Res.
Malad City
Montpelier
Bear Lake
Preston
Soda Springs
Grace
Lava Hot Springs
Downey
Arbon
Oneida
Rockland
Malta
Albion
Burley
Rupert
Minidoka
Twin Falls
Rogerson
Oakley
Hollister
Rockcreek
Threecreek
Roseworth
Wickahoney
Riddle
Owyhee
Jordan Valley
Silver City
Murphy
Owyhee
Reynolds
Rockville
Wilson
Owyhee
Orchard
Taft
Cleft
Soldier
Carey
Pagari
Tilden
Moreland
Tabor
Basalt
Firth Sta.
Shelley
Aberdeen
American Falls
Minidoka
Falls
Shoshone
Wendell
Jerome
Shoshone Falls
Hagerman
Austin
Dairy
Mahoney
Lowry
Bliss
Hotsprings
Grandview
Bruneau
Duck Valley Ind. Res.
Nevada
Utah
Oregon
Wyoming
Montana
Idaho
Yellowstone National Park
Lake Yellowstone
Lake Lodge
Lake Junction
Lake Station
Lake Ranger Station
Old Faithful
Upper Geyser Basin
Lower Geyser Basin
Mammoth Hot Springs
Gardiner
Yellowstone Park
Rexburg
Lyman
Annis
Chapin
Victor
Wyoma
Irwin
Teton
Hadley
Wilford
Hibbard
Elgin
Menan
Idaho Falls
Ucon
Iona
Antelope
Shelley
Prospect
Coltman
Robert
Lewisville
Ririe
Presto
Heise
Swan Valley
Palisades
Irwin
Alpine
Grover
Freedom
Etna
Auburn
Cokeville
Kemmerer
Diamondville
Opal
Fossil
Cumberland
Evanston
Piedmont
Bear Lake
Montpelier
Georgetown
Bennington
Paris
Ovid
Geneva
Dingle
Sta.
Bloomington
Meadow
Whig
Franklin
Weston
Oxford
Clifton
Preston
Malad City
Holbrook
Samaria
Cherry Creek
Stone
Arimo
Inkom
Pocatello
Chesterfield
Fort Hall
Fort Hall Indian Res.
Blackfoot
Firth
Basalt

of which become hard and scaly, and occasionally corneous, with a tendency to excrescences. This disease seldom yields permanently to any plan of treatment yet known.

Icica (ī'si-ka), a genus of plants, nat. order Amyridaceæ, mostly large trees, natives of South America. *I. altissima*, the cedar-wood of Guiana, is a useful timber. All of these trees yield a transparent fluid resembling turpentine in many of its properties, and sometimes named *icica*, also *elemi* or *copal*.

Icolmkill (ī-kō'ni-um). See *Konia*.

Iconium (ī-kō'ni-um). See *Konieh*.

Iconoclasts (ī-kon'o-klastz), image-breakers, the party in the early Christian Church that would not tolerate images, much less the veneration of them. At first images of martyrs and bishops were placed in the churches merely to keep their memory fresh, but in the sixth century they began to be worshiped, lights being burned before them and incense offered in their honor. The eastern emperor Leo III issued an edict in 726 ordering the people to abstain from the worship of such images, and soon after he decreed their destruction. This caused great commotion, and there arose two parties in the church, the image-worshipers and the *Iconoclasts* or image-breakers, who each in turn persecuted the other. In 754 a council at Constantinople condemned image worship; in 787 the second council of Nice (Nicæa) asserted and defined the doctrine. The controversy lasted over a century, coming to an end when, under the Empress Theodora, a council held at Constantinople (842) declared in favor of the worship of images among the Greeks, a decision which was confirmed by a second council, held 869-870, in the same place. In the Western Empire also images were at first retained only to preserve the memory of pious men, but the decision of the pope, which allowed the veneration of images, finally prevailed in the Western Church. See *Iconolatry*.

Iconographic (ī-kon-o-graf'ik), written in pictures; applied to books profusely illustrated.

Iconolatry (ī-kon-ol'a-tri), the worship or adoration of the images of sacred personages connected with the Christian religion, as images intended to represent angels, the Virgin Mary, saints, martyrs, etc. Iconolatry must not be confounded with idolatry, which worships objects as being themselves divine or possessing supernatural power. The worship or adoration of images was not common in the church for several centuries after Christ, and in its earlier stages it excited strong feelings, especially in the Eastern section of the church. (See *Iconoclasts*.) The second council of Nicæa taught that images were to be retained, but that they were not to be objects of adoration in the strict sense, though it was right to salute, honor, and venerate them, and to burn lights and incense before them. This decree was rejected by Charlemagne and by a council at Frankfort in 794, but the practice of image worship finally established itself in the West. Roman Catholics maintain that the cultus of images is 'relative,' and that they are not in themselves really adored or honored, 'but that all worship and veneration is referred to the prototypes.'

Icteridæ (ik-tēr'i-dē), a family of American passerine birds, allied to the starlings, remarkable for the hammock-like nests which they construct, and hence called *hangnests*. The Baltimore oriole may be regarded as typical.

Ictinus (ik-tī'nus), an ancient Greek architect of whom little is known except that he was the chief architect of the Parthenon of Athens, 438 B.C.

Icy Cape, a cape of Alaska, in the Arctic Ocean, lat. 71° N., lon. 161° W.

Ida (ī'da), in ancient geography:—(1) A mountain range in the Troad (Mysia), at the foot of which lay the city of Troy. Its highest peak was Gargarus, about 4650 feet. (2) The middle and highest summit of the mountain chain which divides the island of Crete from east to west. This peak affords a fine prospect, and is covered with woods of pine, maple and cedar, but is not fertile.

Idaho (ī'da-hō), one of the United States. It lies on the western slope of the Rocky Mountains, having Montana and Wyoming on the east, and Washington and Oregon on the west, Utah and Nevada on the south, and British America on the north; area, 83,888 square miles. It owes its rise and importance to its rich gold fields, previous to the discovery of which, in 1860 and subsequently, the territory was inhabited only by Indians. The State is largely mountainous, the summits rising to 12,000 and 13,000 feet. In the center are the Salmon River Mountains, to which belongs the picturesque and lofty Saw-tooth Range. Its chief rivers are the Lewis or Snake River and the Salmon River, the latter a tributary of the former, which again joins the Columbia. Along the course of the Snake River in the S. E. and

s. is a desert tract 400 miles long by 40 to 60 broad. There are valuable forests, but they extend over only a small area. The scenery along the Salmon River in some places is grand, the stream flowing between perpendicular walls of rock from 500 to 2000 feet high. The Snake River has three large and fine cataracts, one of which, the Shoshone Falls, rivals Niagara in magnificence when the water is high. Idaho is rich in mineral deposits, especially gold, silver, lead and copper. The annual output of lead is valued at over $16,000,000. Zinc mining is also profitable. Mineral springs are numerous. The climate is varied, severe in the mountains and mild in the river valleys. The higher mountain ranges are bleak and barren, but the lower hills are generally well wooded, and the soil of the valleys is productive. Irrigation projects, undertaken by the government and by private capital, have opened great stretches of territory for agricultural purposes. Notable among these projects is the Arrowrock Dam (351 feet high, 1060 feet long) across the Boise River. Idaho, with Montana and much of Wyoming, was made a Territory in 1863; reduced to its present limits in 1864-68; and admitted as a State in 1890. Boise is the capital and largest city. Pop. (1900) 161,772; (1910) 325,594; (1920) 431,866.

Idaho Falls, a city, county seat of Bonneville Co., Idaho, 50 miles N. N. E. of Pocatello, in an irrigated district, with good water power. It has flour mills, sugar factory, etc. It is on the Oregon Short Line Railroad. Pop. (1920) 8064.

Idalium (i-dā'li-um; now DALI), a promontory of the east coast of Cyprus on which was a celebrated temple of Venus; hence her surname *Idalia*.

Iddesleigh (id'des-lē). STAFFORD HENRY NORTHCOTE, FIRST EARL OF, an English statesman (1818-87). He held various offices, and represented several constituencies in Parliament, being long member for North Devon. He published a treatise, *Twenty Years of Financial Policy*, in 1862. He was made special commissioner to America to arrange the *Alabama* difficulty. Subsequently he was secretary for India (1867-68) and chancellor of the exchequer (1874-80). Upon Mr. Disraeli's elevation to the peerage he became leader of the Lower House, his task being all the more difficult on account of the Parliamentary obstruction of the Irish Home Rule party. He was elected lord rector of Edinburgh University in 1883. Lord Salisbury having undertaken to form a government, he was created (1885) Earl of Iddesleigh, and became first lord of the treasury.

Ide (īd), a fish of the carp family (Cyprinidæ), the *Leuciscus idus*, found in rocky lakes of Northern Europe. It is a good table-fish, which might be introduced into American waters.

Idea (ī-dē'a), as a term in mental philosophy, has been used in various senses. Plato regarded ideas as the archetypes or original models of things, as existing from eternity and constituting the patterns according to which the Deity fashioned the various things of which we become cognizant by our senses. According to Plato, ideas are independent of matter, and it is they that are the only objects of true knowledge. Aristotle opposed Plato's doctrine of independent ideas, but held the doctrine of ideas being types or patterns accompanying material things. By Descartes and many modern philosophers the word is employed to signify all our mental representations, all the notions which the mind frames of things. See also *Idealism*.

Idealism (ī-dē'al-izm), the philosophical term which, in contradistinction to *realism*, expresses the view that subjective or ideal existence is not only the original but the only true being, and according to which there is allowed to sensible objects merely a phenomenal existence dependent upon the mind of a thinking subject. In modern times idealism has been maintained by Descartes, Berkeley, Kant, Fichte, Schelling, and Hegel. Some of these, as Descartes and Kant, are not, however, pure idealists, inasmuch as they allow at least a problematical existence to sensible things independent of the thinking subject. Berkeley is perhaps the most thorough-going idealist, holding that what is called matter consists merely of ideas, that is, appearances produced in the mind by the direct influence of the Deity. This dogmatic idealism of Berkeley differs from the critical or transcendental idealism of Kant. This consists in the doctrine that all the material of experience is given in sensation, but on the other hand the forms of the experience (space, time, and the categories of the understanding) arise in ourselves *a priori*, and that accordingly sensible objects are known only as they appear to us and not as they are in themselves. Fichte, on the other hand, rejected the notion of things in themselves as untenable and self-contradictory, and created the system of so-called subjective idealism, according to which the I or thinking subject produces the appearance of a sensible world by a mode of activity

grounded upon its essential nature. The theories of Schelling and Hegel are developments of the Fichtean doctrine.

Identity (ī-den'ti-ti) of person in point of law must often be proved in legal proceedings, as in proving a thief, etc. The usual proof is the oath of one who was cognizant of the facts at the time referred to. A common defence of persons accused of crime is that it is a case of mistaken identity, in which case the prisoner must usually prove an *alibi* —*i.e.*, that he was in some other place at the time specified.

Ides (īdz), Latin *Idus*, with the Romans, the 15th day of March, May, July, and October. In the other months the 13th was the ides. The *ides* of March, on account of Cæsar's assassination having taken place on that day, was an *ater dies* or black day, and the senate was not allowed to sit. See *Calendar*.

Idiocy (id'i-u-si). See *Idiot*.

Idiosyncrasy (id-i-u-sin'kra-si), a distinctive peculiarity of the mental or bodily constitution of any person, or that constitution or temperament which is peculiar to any person. The more marked idiosyncracies are found chiefly in persons of neurotic type.

Idiot (id'i-ut), a person who, from original defect, is almost destitute of intelligence, or in whom the intellect seems to be almost wholly wanting. In some cases the intellectual development is so low that there appears to be little more than a vegetative life. Others not quite so low in the intellectual scale recognize the persons with whom they live, are capable of being affected by certain emotions, understand a few questions, articulate a few words, and are able to take their own food, but are quite unable to do any kind of work. Those endowed with a little more intelligence may sometimes be employed in some kinds of labor which present no complicacy or difficulty, but they are incapable of performing any intricate calculation or going through any long train of reasoning. The brain of idiots is sometimes sufficiently regular in its conformation, although in the great majority of cases there is something abnormal. The forehead is often depressed, receding, and flattened; sometimes the back parts of the head are disproportionately large. The majority of idiots are of small stature and of weak constitution, rarely living beyond forty years. The causes of idiocy are not well known. It may be hereditary.

Idocrase (ī'do-krās), a mineral sometimes massive, and very often in shining prismatic crystals. Its primitive form is a four-sided prism with square bases. It is called also *Vesuvian* or *Pryamidal Garnet*, and differs from common garnet chiefly in form.

Idolatry (ī-dol'a-tri), the worship of an image, object or symbol as having in itself some divine or supernatural power, and being able in some way to respond to the worship paid to it, such images or objects being called *idols;* or the adoration of something merely natural as something supernatural and divine. Many have regarded idolatry as a declension from the one true God, and have seen in the various forms of heathen worship only more or less complete degradations of an original revelation. Others see in idolatry an innate searching after God, and regard it as the first stage of human development, the necessary beginning of a knowledge of God. Idolatry may assume various forms; it may consist in a worship of the powers of nature, or of the heavenly bodies, or in animal worship, or in the worship of images representing mere fanciful and imaginary deities, or in the still lower fetichism.

Idria (ē'dri-a), a town of Austria, in Carniola, 21 miles southwest of Laibach, celebrated for its mines of quicksilver, which, after those of Almaden in Spain, are the richest in Europe, and employ in mining and smelting about 1300 persons. Pop. 5772.

Idris (ī'dris), a mythical figure in Welsh tradition, at once a giant, a prince, and an astronomer. His rock-hewn chair may be seen on the summit of Cader Idris, and the tradition tells that any Welsh bard who should pass the night in this chair would be found in the morning either dead, mad, or with supernatural poetic powers.

Idumea (id-u-mē'a). See *Edom*.

Idun, or IDUNA (e-dö'na), a goddess in the Scandinavian mythology, wife of Bragi, keeper of the apples of which the gods ate to keep themselves young.

Idyl (ī'dil; from Gr. *eidyllion*, a 'little image') is the name originally and still most usually applied to a short and highly finished descriptive poem, especially if it treats of pastoral subjects, though this last circumstance is not an essential character of the idyl. All that is necessary to constitute a poem of this class is that it presents to view a complete picture in small compass.

Ieisk, or YEISK (ya'isk), a seaport of Russia, on the Sea of Azov. It was laid out only in 1848, but has rapidly

increased, and now has nurseries, tanneries, tile-works, oil-mills, soap-works, etc., and a considerable trade. Pop. 35,446.

Iekaterinburg. See *Ekaterinburg.*

Ieletz, or YELETZ, (yē'letz), a town of Russia, gov. of Orel, at the confluence of the Ieletz and Lutchka. It has flourishing manufactures, and an extensive trade. Pop. 37,455.

Iesi, or JESI (yā'sē), a walled town of Italy, in the province of Ancona, 17 miles S. W. of Ancona. Pop. (commune) (1910) 24,777.

If (ēf), a small island near Marseilles, on which is the Château d'If, built by Francis I in 1529. It was later used as a state prison, Mirabeau and Philippe Egalité being among its occupants.

Iglau (ēg'lou), an old town of Austria, the largest in Moravia next to Brünn, on the Iglawa, 49 miles W. N. W. of Brünn. The staple manufacture is woolen cloth. Pop. (1910) 68,639.

Iglesias (e-glā'ze-ăs), a walled town of Sardinia, in the province of Cagliari. In its vicinity are lead, zinc, and other mines. Pop. (commune) 20,874.

Iglesias (i-gle'sī-as), MIGUEL, statesman and soldier, was born at Cajamarka, Peru, in 1822. He became active in politics, was made minister of war, and aided in defending Lima against Chilean invasion in 1878. He was subsequently made President of Peru, and signed the treaty of peace with Chile in 1883. He lost his seat through an insurrection in 1886, and subsequently lived in Spain.

Igdrasil. See *Ygdrasil.*

Iglo (ēg'lō), a manufacturing and mining town of Northern Hungary, on the Hernad. Pop. 7500.

Ignatieff (ig-nā'te-ef), NICHOLAS PAULOVITCH, Russian soldier and diplomatist, born in St. Petersburg, in 1832. He served in the Crimean war, and was made a colonel in 1856. In 1858 he was sent on a special mission to Bokhara and Khiva, and afterwards as ambassador to Peking 1860. He was appointed minister at Constantinople, 1864, and was envoy extraordinary, 1867-78. He was conspicuous in the negotiations before and after the Russo-Turkish war, and was appointed minister of the interior, but was dismissed in 1882. He represented the party in favor of war, in opposition to Prince Gortschakoff. He was subsequently made governor-general of Irkutsk.

Ignatius (ig-nā'she-us), ST., Bishop of Antioch, one of the apostolic fathers, said to have been a disciple of the apostle John. His life and death are wrapped in fable. According to the most trustworthy tradition he was appointed Bishop of Antioch A.D. 69, and was thrown to wild beasts in the circus of Antioch by the command of Trajan, the date being given by some as A.D. 107, by others as A.D. 116. By the Greek Church his festival is celebrated on Dec. 20, by the Latin on Feb. 1. In the literature of the early Christian church Ignatius holds an important place as the reputed author of a number of epistles. These have come down to us in three forms. In the longest text they are 13 in number, but since the discovery of a shorter text containing only 7 the first has been universally recognized as in great part spurious, some of the letters entirely so, and others containing interpolations. But even in this shorter form their genuineness has been disputed by numerous scholars. Both of these texts are in Greek, but a still shorter text in the Syriac language, containing only three letters, exists. Some maintain that the Syriac text was the earliest, though not earlier than the middle of the second century. Others hold the genuineness of the shorter Greek text.

Ignatius, ST., Patriarch of Constantinople, son of the Emperor Michael I, was born about 798; died in 878. When his father was deposed he entered a monastery, assuming the name of Ignatius. In 846 he was raised to the patriarchate. He was opposed to the Iconoclasts, and his refusal to admit Bardas, brother of the Empress Theodora, as a communicant, on account of his reported immorality, led to his deposition in 857. The schism between the Greek and Roman Churches began while Photius, his successor, was in office, and has continued ever since. He was reinstated in 867, and at an ecumenical council assembled at Constantinople in 869 Photius and his party were condemned

Ignatius Beans, ST., the seeds of a large climbing shrub (*Ignatiana philippinica*, or *Strychnos Ignatii*) of the nat. order Loganiaceæ, nearly allied to that which produces nux vomica, inhabiting the Philippines, and cultivated in Cochin China. The seeds contain a larger percentage of strychnia than the nux-vomica plant. It was so called by the Jesuits in honor of their founder, Ignatius Loyola.

Ignatius Loyola. See *Loyola* and *Jesuits.*

Igneous Rocks (ig'ne-us), in geology, rocks which are seen to owe their special character or

structure to their materials having been once in a state of fusion, as lava, basalt, granite, etc. Such rocks are not stratified, and may occur in connection with sedimentary rocks of any age, having usually been forced up from below.

Ignis Fatuus (ig'nis fat'ū-us; L. 'foolish fire'), a luminous appearance seen floating over marshy places at night, and sometimes, it is said, in churchyards. It is probably due to some gaseous mixture capable of igniting spontaneously, but it has never been satisfactorily explained, though methane is said to be the source. Also called *Will-o'-the-wisp, Jack-a-lantern.*

Ignorantines (ig-no-ran'tēns), a religious congregation of the Roman Catholic Church devoted to the gratuitous education of children. It was founded about 1683 by the Abbá de La Salle. The statutes of the order, approved by Benedict XIII in 1725, impose on its members vows of chastity, poverty, and obedience. In 1789 the order counted 1000 members, and possessed 121 houses. They were forced to quit France, but were recalled by Bonaparte in 1806. They are now to be met with in various countries. In France the law of 1882 banished them from the public schools.

Igualada (ē-gwá-lä'dá), a town in Spain, province of Barcelona, 36 miles W. N. W. of the town of Barcelona, on the Roya, with manufactures of cottons, woolens, etc. Pop. 10,442.

Iguana (i-gwa'na), a genus of lizards, the type of the family Iguanidæ, a native of Brazil, Guiana, and neighboring localities. It has an average length of about 4 feet. Its food consists almost entirely of fruits, fungi, and other vegetable substances. Its head is large, the mouth wide. Along the whole

Common Iguana (*Iguana tuberculata*).

length of the back to the tip of the tail there is a crest of elevated, compressed, pointed scales; the lower part of the head and neck is furnished with a dew-lap or throat-pouch. The toes are furnished with sharp claws, which enable it to climb trees with ease, while a rapid serpentine movement of its tail propels it swiftly through the water. Its usual color is dark olive-green. Its flesh is considered a delicacy, being tender and delicately-flavored, resembling that of a chicken. The eggs, of which the female lays from four to six dozen, are also eaten, having an excellent flavor. They are about the size of those of a pigeon, are laid in the sand, and hatched by the heat of the sun.

Iguanidæ (i-gwan'i-dē), a family of lizards of which the iguana is the type. They have the body rounded, sometimes laterally compressed and furnished with a ridge or serrated crest along the middle line of the back from snout to tip of tail, sometimes a throat-pouch or dew-lap present. See *Iguana.*

Iguanodon (i-gwan'u-don), an extinct fossil colossal lizard found in the Wealden strata; so called from the resemblance of its teeth to those of the iguana. The pelvic bones were strikingly like those of birds. The integument does not seem to have possessed the spines or bony plates of allied species. The anterior vertebræ were slightly amphicœlous, the posterior flat. The lower jaw was notched for the reception of the beak, as in the parrot. The teeth were large and broad, implanted in sockets, and transversely ridged. Mantell, its discoverer, estimated the length of the animal at from 60 to 70 feet, but Owen's calculation is 30 feet.

Ihlang-ihlang (ē'lang-ē'lang). See *Ilang-ilang.*

Ihre (ē're), JOHAN, a Swedish scholar, born in 1707; died in 1780. He became librarian at Upsala, where he obtained in 1737 the chair of literature and politics in the university. His most important work is called *Glossarium Suiogothicum* (a Swedish-Latin dictionary).

Iki (ē'ki), an island off the N. W. corner of Kiushiu, Japan, in Korea Strait. Gonoura is a small seaport on the S. W. of the island. Pop. about 36,000; area 57 square miles.

Ilang-Ilang (ē'lang-ē'lang; *Cananga odorāta*), a large tree of the order Anonaceæ, cultivated in India and the Philippines, and yielding from its flowers a rich perfume.

Ildefonso, SAN (sän el-dā-fon'sō), a village of Spain, where is La Granja, a royal palace, built in a mountainous country by Philip V, in imitation of Versailles, 6 miles northeast of Segovia, 40 north by west of Madrid. The palace contains a great number of valuable paintings, statues, etc., and the gardens are magnificent.

Ile-de-France (ēl-dē-fräns), an old province of France,

having Paris as its capital, and now mostly comprised in the departments of Seine, Oise, and Seine-et-Oise.

Iletzk (ē-letz'), a town in the Russian Gov. of and 45 miles S. of Orenburg. Pop. 12,000. Close by is the richest salt-bed in Russia, yielding about 200,000 tons of salt annually.

Ilium (il'e-um), in anatomy, a name given to the lower three-fifths of the small intestines.

Ilex (ī'leks), the genus to which the holly belongs; also a name for the evergreen oak or holm-oak. See *Holly* and *Holm-oak*.

Ilford (il'ford), a town of Essex, England, 7 miles E. N. E. from London by railroad. It has large photographic works and paper-mills. The chapel of the 12th-century Hospital of St. Mary is of archeological interest. Pop. (1911), 78,205.

Ilfracombe (il'frȧ-köm), a market-town in England, Devonshire, on the Bristol Channel, 41 miles N. W. Exeter; very picturesquely situated. There is an inner and an outer harbor, and an active trade in coal, cattle, and agricultural produce with Welsh and Irish points. Ilfracombe is a bathing-place and health resort. Pop. 8935.

Ili (ē'yē), a river of Central Asia, partly in Chinese territory, but mostly in Russian. It is formed in Chinese Kuldja by two streams, the Tekes and Kunges, rising in the Thian-shan Mountains, and flows westwards, falling into Lake Balkash by several mouths after a course of 800 or 900 miles, half of which is navigable.

Iliad (il'i-ad). See *Homer*.

Ilion (il'i-on), a village of Herkimer Co., New York, on the Mohawk River and Barge Canal, and on the New York Central and West Shore railroads, 12 miles E. S. E. of Utica. The largest factory of the Remington Typewriter Co. (3500 employees) is here. The great plant of the Remington Arms Co., manufacturing small military and sporting arms (established in 1816) gives employment to 2500 workers. Other products are card indexes, show cases, etc. Pop. 10,169.

Ilithyia (i-lith-i-ī'a), among the Greeks the goddess who assisted women in childbirth. In after-times she was identified with Artemis (Diana).

Ilium. See *Troy*.

Ilkeston (il'kes-tun), a market-town of Derbyshire, England, 9 miles E. N. E. of Derby, situated on a lofty hill. The church is a fine ancient edifice. Manufactures of hosiery and lace are here carried on to a great extent, and a number of the inhabitants are employed in mining coal and iron-stone. Pop. (1911) 31,673.

Ilkley (ilk'li), a village of Yorkshire, England, 31 miles west of York, beautifully situated on the Wharfe, and much resorted to by visitants to the hydropathic establishments. Near Ilkley is the fine old ruin of Bolton Priory. Pop. (1911) 7992.

Illampu (ēl-yȧm-pō'). See *Sorata*.

Illapel (ēl-yȧ-pel'), a town of Chile, province Coquimbo. Pop. 3200.

Ille-et-Vilaine (ēl-e-vi-lān), a maritime department in the N. W. of France, lying between the English Channel and the department of Loire-Inférieure. It is watered mainly by the rivers from which it derives its name—the Vilaine, and its tributary, the Ille. Little more than one-half of the surface is arable. The cereal crops consist chiefly of wheat, meslin, rye and oats; other crops are buckwheat, hemp, tobacco, and flax. The minerals include iron, zinc, and lead. The principal manufactures are leather, sail-cloth, sacking, and coarse linens, and the coasting trade is active. Rennes is the capital; St. Malo the chief seaport. Pop. (1906) 611,895.

Illegitimacy (il-e-git'i-ma-si). See *Bastard*.

Illicium (il-li'si-um), a genus of eastern Asiatic and American evergreen deciduous shrubs, belonging to the nat. order Magnoliceæ. The plants of this genus are called aniseed-trees, from their fine aromatic scent. The fruit of *I. anisātum* (Chinese anise) is the star-anise of the shops (see *Anise*). *I. religiōsum* is a Japanese species, held sacred by the natives, who decorate the tombs of their dead with wreaths of it, and burn the fragrant bark as incense before their deities.

Illimani (il-yi-mä'nē), one of the loftiest peaks in the Bolivian Andes, fully 21,000 feet high, and covered with glaciers.

Illinois (il'i-noi or -nois), one of the North Central United States, bounded on the north by Wisconsin, east by Lake Michigan and Indiana, southeast by Kentucky, from which it is separated by the Ohio, and west by the Mississippi, separating it from Missouri and Iowa; greatest length, 370 miles; greatest breadth, 210; area, 56,665 square miles. The surface is somewhat hilly near the Ohio, and undulating towards the west; and a range of bluffs runs for a considerable distance along the margin

ILLINOIS
Scale of Miles
0 5 10 20 30 40 50 60
Longitude West from Greenwich
WISCONSIN
MICHIGAN
LAKE
INDIANA
KENTUCKY
IOWA
MISSOURI
Chicago
Evanston
Rockford
Freeport
Dubuque
Rock Island
Moline
Galesburg
Peoria
Joliet
Aurora
Elgin
Waukegan
Kankakee
Ottawa
Streator
LaSalle
Bloomington
Decatur
SPRINGFIELD
Quincy
Danville
Terre Haute
Jacksonville
Alton
East St. Louis
St. Louis
Belleville
Centralia
Mt. Vernon
Carbondale
Cairo
Metropolis
Shawneetown
Harrisburg
Marion
Vincennes
Lawrenceville
Olney
Mattoon
Champaign
Urbana
Kankakee
Ottawa
Cedar Rapids
Iowa City
Clinton
Davenport
Rock Island
Moline
Galesburg
Peoria
Bloomington
Springfield
Decatur
Danville
Joliet
Aurora
Chicago
Evanston
Rockford
Freeport
Dubuque
Alton
East St. Louis
Belleville
Centralia
Mt. Vernon
Carbondale
Cairo
Metropolis
Shawneetown
Harrisburg
Marion
Vincennes
Lawrenceville
Olney
Mattoon
Champaign
Urbana
Kankakee
Ottawa
Streator
LaSalle
Quincy
Jacksonville
Terre Haute
Missouri R.
Mississippi R.
Ohio R.
Wabash R.
Illinois R.
Kaskaskia R.
Big Muddy R.
Embarras R.
Little Wabash R.
Sangamon R.
Fox R.
Rock R.
Kishwaukee R.
Green R.
Iowa R.
Cedar R.
Des Plaines R.
Calumet R.
Lake Michigan

of the Mississippi; but with these exceptions the state is one continuous plain, with a gentle inclination towards the southwest. It has a greater proportion of arable land than any other state of the Union, the state standing centrally in the great prairie region, with its deep, rich soil. The only part of the state thickly wooded is the extreme south portion. The chief rivers are the Illinois, which traverses the state diagonally northeast to southwest, Rock, Kaskaskia, and Wabash. There are many smaller streams, and the state is very well watered. Indian corn and oats are the chief objects of cultivation, but wheat, hay, buckwheat, potatoes, turnips, cotton, hemp, flax, tobacco, castor-bean, etc.. are also produced, and the cultivation of the vine is making considerable progress. Fruits are largely grown, including apples, peaches, plums, cherries, and the various berries; while potatoes, hops, tobacco, flax-seed, and broom-corn are among the other products. The common domestic animals are abundant, and immense numbers of swine are reared. Though chiefly an agricultural and manufacturing state, Illinois has important mineral resources. Bituminous coal abounds, and the state ranks next to Pennsylvania in coal product. Other minerals are limestone, pig iron, Portland cement, fluorspar, natural gas, etc. Copper lead and zinc are mined in small quantities, and there are quarries of marble and gypsum. Mineral springs are found in the southern part of the state. The rocks mostly are limestone, gypsum, and sandstone. The climate, although somewhat humid, is generally healthy. The commerce and manufactures have been largely developed of late years, and there is a greater development of railroads than in any other State. On the Great Lakes there is a large fleet of steamers engaged in carrying iron ore, cereals, and other products between the lake ports. The Illinois and Michigan Canal, at La Salle, and the canal from Hennepin to Rock River provide a waterway from Chicago to the Mississippi. Among the educational institutions are the University of Illinois at Urbana (founded, 1868; students, 9200); University of Chicago (founded, 1892; students, 10,880); Northwestern University, Evanston (founded, 1855; students 7760); James Millikin University, Decatur; Knox College, Galesburg; Illinois Wesleyan University, Bloomington, and many others. Illinois was made a Territory in 1809; admitted to the Union in 1818. Capital, Springfield; largest city, Chicago. Pop. (1900) 4,821,550; (1910) 5,638,591; (1920) 6,485,280.

Illinois, a river of the United States, formed by the union of the Kankakee and Des Plaines, in the N. E. part of the state of Illinois. It flows thence S. W., and falls into the Mississippi about 20 miles above the mouth of the Missouri. It is 500 miles long, half of it being navigable. A canal connects the river with Chicago.

Illuminated MSS. See *Manuscripts.*

Illuminati (i-lū-ma-nā'ti; the enlightened), a name given to members of several societies, especially to those of a secret society founded in 1776 by Adam Weishaupt, professor of law at Ingolstadt, Bavaria, for mutual assistance in attaining a higher degree of morality and virtue. It spread over Roman Catholic Germany, and contained in its most flourishing condition 2000 members, among whom were individuals of distinguished talents and high rank. The constitution and organization were taken partly from the Jesuits and partly from the Masons. Dissensions, however, arose and in 1784 it was dissolved by the Bavarian government. The members were also called Perfectibilists.

Illusion (i-lū'zhon). Much attention has been devoted by experimental psychologists during recent years to the phenomena of optical illusion by means of geometrical figures. No complete classification has been made of these, but the following classes contain the best known: 1. Illusions of Reversible Perspective. There are certain figures which are capable of two or more perspective interpretations. It is characteristic of these figures that as one looks at them the shift of perspective occurs spontaneously and at irregular intervals. An instance of this is seen in Figure 1, which may be seen either as a square block resting upon the ground or as a block projecting upwards and to the left from the plane of the paper.

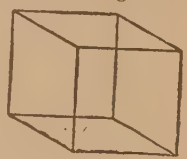


Fig. 1. Wheatstone's Cube.

2. Illusions of Extent. These fall into two classes: Constant and Variable. An instance of the latter is seen in Figure 2. Although the dimensions in these figures are objectively similar, the filled spaces appear larger than the open. 3. Illusions of Direction. These also may be constant or variable. An instance of the former class may be seen in Figure 3, which is known as Von Recklinghausen's illusion. If the figure is held a short distance from the eye and

its center steadily fixated, the hyperbolas become straight lines so that the figure resembles a chessboard. 4. Illusion of

Fig. 2. Helmholtz's Squares.

Association. These fall into two divisions, assimilative and contrastive, both of which may be produced by a series of rectangles according to the system of Müller-Lyer. 5. Mixed illusions. Produced by a combination of the preceding.

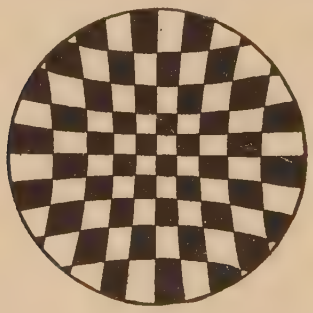


Fig. 3. Von Recklinghausen's Illusion.

6. Illusions of Movement. There are various explanations of these results, but it may be that the interpretation must be drawn from the sciences both of physiology and psychology.

Illyria (il-lir'i-a), ILLYR'ICUM, a name formerly rather loosely applied to a large tract of country on the east side of the Adriatic, the ancient Illyrians being ancestors of the modern Albanians. Piracy was carried on by the Illyrians, whose kings were therefore embroiled in quarrels with the Romans, which ended in their subjugation in 228 B.C. They sought from time to time to shake off their chains, but being always beaten, the country at last became a Roman province. The name of Illyrian provinces was given, by a decree of Napoleon in 1809, to Carniola, Dalmatia, and other countries, then part of the French Empire. After the fall of Napoleon the Illyrian Provinces were restored to Austria, and designated as the Kingdom of Illyria, a title which the country bore till 1849, when it was divided into the provinces of Carinthia, Carniola, and the Coast-lands

Ilmen (il'men), a lake in Russia, gov. of Novgorod, near its western borders; length about 33 miles, breadth 28. It receives numerous streams, and discharges itself by the Volkhov into Lake Ladoga.

Ilocos Norte (ē-lō'kōs nōr'te), a province of Luzon, Philippine Islands, at N. W. corner of the island. Area, 1265 sq. miles; pop. (1920) 218,951.—ILOCOS SUR, a Philippine province of Luzon, lying S. of Ilocos Norte. Area, 491 sq. miles; pop. 217,410. Both provinces are fertile, and have textile and other industries.

Iloilo (ē-lō-ē'lō), a province of Panay, Philippine Islands, occupying the southern half of the island. The textile industry is in a flourishing condition here. Area, 1776 sq. miles. Pop. 508,272. The capital is Iloilo, on the S. E. side of the island, on the strait separating Guimara Island from the mainland. There is a good harbor. It has many industries and a large commerce; exports tobacco, copra and hemp. Pop. 50,000.

Image (im'ij), in optics, the spectrum or appearance of an object made by reflection or refraction. It is by means of optical images that vision is effected, or that the telescope and microscope are of use. See the articles *Optics*, *Eye*, etc.

Image Worship. See *Iconolatry.*

Imaginary Quantity (i-maj'i-nari), in algebra, such quantity as $-a^2$ in the equation $x^2 = -a^2$, when to find the value of x we should require to take the square root of $-a^2$; and this is impossible. Any algebraic expression containing $\sqrt{-1}$ is called an imaginary expression. The employment of imaginary quantities systematically has been the foundation of some of the greatest modern discoveries and improvements in geometry.

Imagination (i-maj-i-nā'shun), literally that faculty of the mind by which we can form mental *images* of things. Besides the power of preserving and recalling such conceptions, the imagination has the power to combine different conceptions, and thus create new images or mental pictures. It is this faculty which is more strictly termed imagination. In the creation of new images, or more properly in the combining of images which have previously been derived from objects of perception, the imagination operates according to the laws of the association of ideas. Its operations are nevertheless not wholly independent of the will, for by directing the attention to some leading thought, the

will can determine the limits within which the laws of association are to act, and by practice it can be fostered. Such free and yet regulated action of the imagination alone can give birth to the productions of the fine arts.

Imam (i-mäm′), a class of Mohammedan priests. In Turkey they attend in the mosques, call the people to prayer from the minarets, perform circumcision, etc. In ecclesiastical affairs they are independent, and are not subject to the mufti, though he is the supreme priest. They quit their office and reënter the lay order. The sultan, as chief of all ecclesiastical affairs, has the title of *imam*.

Imaus (i-mā′us), a name applied by the ancients sometimes to the Hindu Kush and the western part of the Himalayan range, and sometimes in a vague way to a range in Central Asia (supposed to be the Altaian Mountains), which they believed to divide the vast region to which they gave the name of Scythia, into two parts.

Imbecility (im-be-sil′i-ti), weakness of mind, such as puts a person considerably below the general run of mankind, but is not so great as to be called lunacy or idiocy, nor so well marked perhaps as to be classed under any one of the forms of insanity. Imbeciles sometimes display a considerable amount of intelligence in certain directions, and are often very cunning. They may be interesting, amusing, and even useful members of a community. Equity will not set a contract aside on the mere ground of imbecility; but its existence affords a material ingredient in examining whether it has been obtained fraudulently or by undue influence. In general the court is ready to support the obligation of any contract that a person of weak mind has entered into, unless it is of such a nature that a person of sound mind would not have agreed to it, or unless there is suspicion of fraud. An imbecile person may be summoned as a witness, but the degree of credibility attaching to his evidence naturally depends very much on the amount of intelligence he displays, and on the nature of the circumstances regarding which his evidence is offered.

Imber (im′bėr), Imber-goose, Ember-goose, a name sometimes given to the great northern diver.

Imbro (im′bro), or Imbros, an island of European Turkey, west from the entrance to the Dardanelles, 18 miles long and 8 broad. It is mountainous, well wooded, and intersected with richly-fertile valleys, producing wine, honey, oil, cotton, and lead. It has several villages. Pop. 1000, mostly Greeks.

Imeritia (ē-mē-rish′i-a), or Imeréthi, Russian district on the south of the Caucasus, now included in the government of Kutais. It formed part of the Kingdom of Georgia in the fourteenth century; became afterwards independent, and in 1804 it was voluntarily ceded to Russia by the last of its sovereigns.

Immaculate Conception. See *Conception* (*Immaculate*).

Immersion (im-ėr′shun), in astronomy, the disappearance of one heavenly body behind another or into its shadow. Immersion occurs at the beginning, and emergence at the end of an occultation or an eclipse.

Immigration (im-i-grā′shun), the entry of aliens to a country for purpose of settlement and permanent residence. This subject has been treated in its general aspects under the head of emigration (which see). But the subject of immigration has a particular application to the United States, the present great population of which, aside from its few Indians, is wholly the result of alien inflow, forcible on the part of its negro population, voluntary on that of the whites. And within the recent period this inflow of settlers has proceeded at a rate unprecedented in the history of any other country, the United States having become the great reservoir into which flows the excess population of Europe, and in a measure that of various other parts of the world. The earliest permanent settlements of immigrants within the area of the United States was at Jamestown in 1607, New York in 1613, and New England in 1620; other localities being successively settled during the seventeenth and eighteenth centuries. Most of the nations of Europe were represented in the inflow, though the numbers were small as compared with those of a later date, the total immigration up to 1820 being estimated at only 250,000 persons, much less than that of a single year at the present time. The inflow of Africans began in the slave ships of an early date, the first reaching Jamestown in 1620. We have no official record of the number of settlers reaching this country until the year 1817, when Congress provided for the making of returns in the several customs districts. In the year named 22,140 arrived, a much larger number than in previous years, and the abuses and suffering on shipboard were so great that Congress was obliged to provide remedies, an act to regulate the ocean transport of passengers being passed in

1819. Since that date collectors of customs have reported the numbers of immigrants arriving in their districts, with age, sex, occupation, and country of birth. The arrivals since then, counting by decades, have been: for the decade ending 1830, 143,149; 1840, 599,128; 1850, 1,713,225; 1860, 2,598,214; 1870, 2,314,824; 1880, 2,812,191; 1890, 5,246,613; 1900, 3,844,420, being a total in the period named of more than 20,000,000 new inhabitants. In the decade 1900-1910 the rate of immigration rapidly increased, passing the million mark in the successive years, 1905-07, and reaching in 1907 the grand total of 1,285,349; the total for the decade being nearly 9,000,000. As for the character of this immigration, it was mainly desirable until within recent years, when much of it became undesirable. In the earlier period Great Britain and Ireland, Germany and Scandinavia supplied the bulk of newcomers, but during the past few decades Southern and Eastern Europe have supplied much the greater number of immigrants, especially Italy, Austria-Hungary and Russia. Immigrants from Canada and Mexico were not counted prior to July 1, 1907, but the census of 1900 showed in this country 1,183,225 persons born in Canada, and 103,445 born in Mexico. Many of the immigrants reaching this country have been for various reasons undesirable, and this was generally the case with the Chinese, who after 1869, when a treaty was made admitting them, came in such numbers that in 1882 a bill was passed prohibiting the entrance of any new Chinese for ten years. In 1892 the law was continued for a second ten years, and the policy of exclusion still holds good. At a later period Japanese laborers began to arrive in large numbers, and the opposition to them became so great that in 1907 acts were passed prohibiting the entrance of any Japanese and Corean laborers. Great numbers of the European immigrants have also proved undesirable for various reasons, such as ignorance, unhealthfulness, criminal record, lack of means of support, etc., and several restrictive measures have been passed; as yet not sufficient to satisfy the demand of the people. One great source of dissatisfaction is the tendency of immigrants to settle in the great cities and their vicinity, overfilling these already congested centers of labor, and to avoid seeking the agricultural districts, where they could be usefully employed. A bureau of information to aid in the latter purpose was established in 1907, its object being the beneficial distribution of aliens among the States and Territories desiring them. This has proved very useful in advising immigrants where they can find profitable employment and has resulted in a better distribution. A commission was appointed for the study of immigration problems at home and abroad. It published a number of reports, the most important being in relation to the white slave traffic. The demand that immigration to the United States should be restricted to those able to read and write in English or in their own language had often been made, and in 1917 Congress carried a bill of this kind over the President's veto. Immigration was much decreased during the war, only 110,618 entering in 1918, the lowest since 1862. In 1921, 805,228 aliens were admitted. The immigration law of May 19, 1921, effective until June 30, 1922 limited the number of aliens admissible to three per cent of the number of the particular nationality in each case resident in the United States as shown by the census of 1910. The British quota was 77,206; German, 68,039.

Immortality (im-or-tal'i-ti), exemption from death; the state of everlasting life. The dogma of the immortality of the soul is very ancient. It is connected with almost all religions, though under an infinite variety of conceptions. By the immortality of the soul we understand the endless continuation of our personality, our consciousness, and will. There are so many reasons to render immortality probable, that with most nations the belief is as clear and firm as the belief in God; in fact the two dogmas are intimately connected in the minds of most men. The hope of immortality must be considered a religious conviction. Reason and religion command man to strive for continued perfection. This duty man cannot relinquish without abandoning at the same time his whole dignity as a reasonable being and a free agent. He must, therefore, expect that a continuation of his better part, as the necessary condition for his progress in perfection, will not be denied to him. Hence the belief in immortality becomes intimately connected with our belief in the existence and goodness of God. Among rude peoples the life after death is usually regarded as a state of being not essentially different from the present—one in which the hunter shall renew his chase, and his corporeal senses shall have their accustomed gratifications. Among the ancient Greeks and Romans the spirits of the dead were believed to live in the other world as a sort of shadows, and the life after death was also considered as a

shadow of the present. Among some peoples the imagination attributes changes of condition to the future life, and the doctrine of transmigration, or the progress of the mind or soul in different stages, is developed. Connected with the belief in the immortality of the soul is the belief in a state where souls are purified after death, which existed among the Egyptians and exists among many Christians. See *Purgatory.*

Imola (ē'mō-lä), a town of Italy in the province of Bologna, on an island in the Santerno, 22 miles S. E. of Bologna. Pop. (1910) 38,369.

Impact (im'pakt), in its simplest aspects refers to the laws of collision of bodies. When a moving body impinges on another body, the bodies may adhere to one another, but usually those portions of the bodies near which the collision takes place are compressed and then regain their original form, thus causing the bodies to rebound from one another. Sometimes, however, the impact may produce a shattering or a permanent deformation of the impinging bodies. Generally part, at least, of the kinetic energy of the bodies is transformed into other forms of energy, such as light and heat. New stars probably arise from the collision of cosmic masses. Taking the simple case in which two spheres moving in the line joining their centers come into collision, there is no total change of momentum, and the relative velocity of the spheres after impact is *e* times their relative velocity before impact, *e* being the co-efficient of restitution. If the colliding spheres are rotating, as is usually the case with billiard balls, or if they collide obliquely, friction comes into play, and the problem is more involved. When a stream of fluid impinges on a solid surface in motion, its velocity during impact relatively to the surface remains unchanged in magnitude.

Impanation. See *Consubstantiation.*

Impatiens (im-pā'shi-enz), a genus of annual or biennial herbs. One species, *I. noli-me-tangere*, or touch-me-not, is a succulent herb with yellow flowers. *I. balsamina* is the garden balsam.

Impeachment (im-pēch'ment), an accusation and prosecution for a crime or misdemeanor, in which the House of Representatives are the prosecutors and the Senate the body of judges. In Britain the House of Commons are the prosecutors, and the House of Lords the judges. The necessity of some tribunal distinct from the ordinary courts, for the trial of certain offences, or for any high misdemeanor in certain officers, is apparent, since the judges of the highest courts cannot in all cases safely be intrusted with the trial of each other. The most noted case of impeachment in this country was that of President Andrew Johnson, in 1868, he being charged chiefly with violation of the Constitution and the Tenure of Office Act. This memorable trial lasted three months, on each vote taken the Senate standing 35 for conviction and 19 for acquittal. As a two-thirds vote is necessary for conviction, the impeachment failed by one vote. In England impeachment is a rare event, the last instance being the trial of Lord Melville, in 1805. A majority vote there is sufficient for conviction, but the crown may pardon the offender. Any civil officer may be impeached.

Impenetrability (im-pen-e-tra-bil'-i-ti), in physics, that property of matter which prevents two bodies from occupying the same space at the same time; or that property of matter by which it excludes all other matter from the space it occupies.

Impennes (im-pen'nez), a name given to swimming birds with small wings which have only rudimentary feathers, as the penguins.

Imperator (im-pe-rā'tur), among the ancient Romans, a term originally applied to a military commander, one who held the *imperium*, or military power. In later times no one received this title who had not defeated a hostile force of at least 10,000 men. After the overthrow of the republic *imperator* became the highest title of the supreme ruler, and acquired the signification which we attach to the word *emperor.*

Imperial Valley, a valley in the extreme S. E. corner of California, with the Colorado River on the east and the Mexican state of Lower California on the south. The Salton Sea, or Sink, in the northern end of the valley, is 265 feet below sea level. By irrigation, dating from 1901, this former worthless desert land has been turned into a rich farming region, popularly termed 'The American Egypt.' El Centro is the Valley's central city.

Imperial Chamber. See *Chamber.*

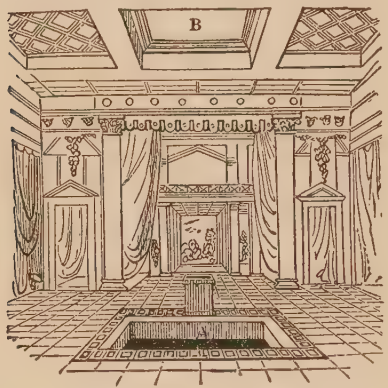
Impetigo (im-pe-tī'gō), a skin disease consisting in an eruption of itching pustules, appearing in clusters, and terminating in a yellow, thin, scaly crust. It occurs most frequently on the extremities.

Impey Pheasant (im-pē; *Lophophŏrus refulgens* or *Impeyānus*), a bird of the pheasant family (Phasianidæ) remarkable for the splendid colors and metallic luster of the

plumage of the male, whence it is called in India (of which it is a native) *monaul*, meaning bird of gold. It is found in the high and cold regions of the Himalaya, and is of the size of a small turkey. It obtained the name of Impey pheasant from the fact that Lady Impey was the first who attempted (unsuccessfully) to introduce the bird alive into Europe.

Implacentalia (im-pla-sen-tal'i-a), the aplacental mammals. See *Aplacental.*

Impluvium (im-plū'vi-um; Lat. *in*, into, *pluto*, to rain), in ancient architecture, a term which de-



Roman Atrium.—A, Impluvium; B, Compluvium.

noted in the houses of the ancient Romans a basin in the middle of the atrium or entrance-hall, below the *compluvium* or open space in the roof, to receive the rain. See *Atrium.*

Impoon (im-pön'), a kind of antelope, Duykerbok (which see).

Impost (im'post), (1) a tax, tribute, or duty, particularly a duty or tax laid by government on goods im-

Imposts.

1, Continuous. 2, Discontinuous. 3, Shafted.

ported. (2) In architecture, the point of junction between an arch and the column, pier, or wall on which it rests. It is often marked by horizontal mouldings, though these may be absent. Imposts have received various names, according to their character. Thus, a *continuous impost* is where the mouldings are carried down the pier; a *discontinuous impost* where there are no mouldings, but the pier is of a different section from the arch; *shafted imposts* are where the arch mouldings spring from a capital and differ from those of the pier.

Impotence. See *Sterility.*

Impressionism (im-pres'yun-izm), the term applied to a modern school of art, which originated in France and has spread to other countries. The work of the impressionists was first exhibited in 1867 and is now to be seen in every exhibition of art work. The aim of the impressionists is to get rid of artistic tradition and to look at nature from an original standpoint. This was also the aim of the pre-Raphaelites, but the impressionists differ from the latter in portraying only the salient features of nature visible in cursory examination and rendering these by brushwork of the thinnest and loosest description. In the work of some of them little care for beauty of color, form, or expression is visible, and the extremists of this school produce work the reverse of attractive.

Impressment of Seamen (impres'ment), the act of compelling persons, especially seafaring men, to serve in the navy. The power of impressing seamen, formerly a common practice in England, though still existing, has fallen into abeyance since the conclusion of the general war in 1815. Impressment was of ancient date, and uniformly practised throughout a long series of years. It has never been adopted in the United States.

Imprimatur (im-pri-mā'tur; Latin, 'let it be printed'), the word by which the licenser allows a book to be printed in countries where the censorship of books is exercised in its rigor. See *Books, Censorship of.*

Imprisonment (im-priz'n-ment), the restraint of a person's liberty, whether in a prison, the stocks, or by merely keeping in custody. It is usually inflicted by way of punishment, the power of sentencing to imprisonment being conferred on certain courts or magistrates, and strictly limited by law. A person may be imprisoned, however, who is merely accused of a crime, in which case he can demand to be released on bail. Imprisonment for ordinary debt is now practically abolished in Great Britain and the United States.

Impropriation (im-prō-pri-ā'shun), in the English Church, the transfer of a benefice to the possession of a layman, the annexing of benefices to ecclesiastical corporations being called *appropriation*, though they are sometimes identical. Appropriations were originally annexed to bishoprics, prebends, religious houses, etc.; but on the dissolution of the monasteries in the reign of Henry VIII the appropriations of the several benefices belonging to them were given to the king, and were afterwards granted out from time to time by the crown. It was after this time that the term *impropriation* was introduced to denote a benefice in the hands of a layman. The appropriator deputed some person to perform divine service in such parish, who, being merely his deputy or vicegerent, was called *vicar*, and his stipend was at the discretion of the appropriator. The distinction therefore of a parson and vicar is that the former is entitled to all the ecclesiastical dues of his parish, while the vicar is in effect only the curate of the real parson (the appropriator), and receives but a part of the proceeds.

Improvvisatori (im-prov-iz-a-tō'rē), the name given in Italy to persons who compose and declaim extemporaneously a poem on any given subject, or sing it, accompanying their voice with an instrument. This has long been a practice in Italy, and many of the *improvvisatori* have acquired considerable celebrity. The poet Metastasio at a very early period showed an extraordinary talent for this kind of composition, but the exercise of it cost so much effort that from a regard to his health he was obliged to give it up. Even at the present day Italy abounds in this class of poetical composers. The printed works of the improvvisatori who have been most admired have never passed mediocrity, and it is probable we should not have had such beautiful poems from Metastasio if he had not been obliged to renounce extemporaneous poetry.

Imputation (im-pū-tā'shun), as a term in Christian theology, is used to signify, on the one hand, the reckoning of the sins of man to Christ, and, on the other hand, the reckoning of the righteousness of Christ to believers.

Ina (ī'na), or INE, king of the West Saxons in the seventh and eighth centuries. He succeeded Ceadwalla about 689, and after having obtained advantages over the people of Kent in 694 he turned his arms against the Britons, from whom he wrested Somersetshire and other parts of the west of England. He then made war on the Mercians; but the contest was terminated, without much advantage to either party, by a bloody battle in 715. He resigned his crown and went as a pilgrim to Rome (728), where he passed the rest of his days in devotion. He was one of the principal legislators of the Anglo-Saxons. His laws are the oldest known to us among the Anglo-Saxon kings, except those of the kings of Kent, and served as the foundation of the code formed by Alfred the Great.

Inagua (ē-nä'gwa), GREAT and LITTLE, two islands, the former about 40 miles from the eastern extremity of Cuba, low and intersected with lagoons, and affording good pasture land; area, 660 sq. miles; pop. 1500. Little Inagua is quite small.

Inaja Palm (in-a-ja'; *Maximiliana regia*), a South American palm growing to the height of over 100 feet, with leaves 30 to 50 feet long. The spathes are so hard and woody as to serve for cooking food on the fire; they are also used as baskets, etc. The fruit is edible.

Inarching (in-ärch'ing), the same as grafting by approach. See *Grafting*.

Inca (in'ka), or YNCA, a word signifying 'chief,' which the natives of Peru gave to their kings and princes of the blood before the Spanish conquest. See *Peru*.

Incandescent Light (in-kan-des'ent). See *Gas* and *Electricity*.

Incantation (in-kan-tā'shun), a certain formula of words, supposed to have some magical effect, especially if uttered with the accompaniment of certain ceremonies. Incantations are still common as a part of popular medicine among the uneducated in many countries.

Incarnation (in-kär-nā'shun; Lat. *in*, and *caro*, *carnis*, flesh), a word used to express the manifestation of the Deity in the flesh under the human form; thus we speak of the *incarnation* of Christ. The Hindus believe in innumerable incarnations of their deities. The most celebrated of these in Hindustan are the nine incarnations of Vishnu. See *Avatar*.

Incense (in'sens), aromatic substances burned in religious rites on account of the sweet odor they emit. The custom of burning incense is ancient and widely spread. Among the Jews the practice was enjoined as part of the worship of the sanctuary (Ex., xxx, 27), the ingredients of the incense also

being laid down, and it was to be burned on a special altar called the *altar of incense*. This altar was made of acacia (shittim) wood, and was overlaid with gold, hence it was also called the *golden altar*, as distinguished from the altar of burnt-offering, which was made of brass. The incense was burned daily—morning and evening. In ancient Egypt, Assyria, Babylonia, India, Greece, and Rome incense-burning was part of the worship of the gods, and it is still employed as part of the Buddhist ceremonial. Both the Greek and the Latin churches use incense in worship, but the practice probably did not arise until the fifth century.

Incest (in'sest), sexual intercourse within the prohibited degrees. From a very early period it has been under the ban of the church, and in early European history was punishable by the civil courts as well. In England, incest was at one time a capital offence, but the punishment of it was afterward left to the spiritual courts, and for some time it was not a crime. The Punishment of Incest Act (1908) made carnal knowledge of a man's mother, sister, daughter, or granddaughter, whether legitimate or illegitimate, a misdemeanor. In the United States, incest is a punishable crime; but the degrees within which marriage is permissible are regulated by the statutes of the various states.

Inchcolm (insh-kōm'), a small island of Scotland, in the Firth of Forth, off the coast of Fifeshire, with the ruins of a monastery founded by Alexander I in 1123, of which Walter Bower, the continuator of Fordun, was abbot from 1418 till 1449.

Inchkeith (insh-kēth'), a small island of Scotland, in the Firth of Forth, off the Fifeshire coast, containing a lighthouse.

Incidence ANGLE OF, (in'si-dens), the angle which a ray of light falling on a reflecting or refracting surface makes with the perpendicular or normal to the surface. The angle of incidence, A B H, is always equal to the angle of *reflection*, H B C.

Inclination, MAGNETIC, or MAGNETIC DIP. See *Dipping Needle.*

Inclination Compass, same as *Dipping Needle.*

Inclined Plane (in-klīnd'), a plane forming with the horizontal plane any angle whatever excepting a right angle. It is one of the mechanical powers by which a small force under certain conditions is used to overcome a greater force. When a body lies on an inclined plane part of its weight is supported, so that if a cord be fastened to it and pulled, a force less than the weight of the body acting in a direction parallel to the plane will prevent it from sliding, or will move it up the plane. Thus a heavy wagon is raised on an inclined road by a horse which would be quite unable to exert a pull equal to a quarter of the weight of the wagon. Neglecting friction, the force parallel to the plane necessary to raise the body is equal to the weight of the body multiplied by the vertical height through which it is lifted, divided by the distance it is moved along the plane.

In Cœna Domini (in sē'na dom'i-ni), a papal bull, so called from its first words, it being annually read 'at the Lord's Supper' on Holy Thursday. Its earliest form was that promulgated in 1363 by Urban V anathematizing all heretics and favorers of heretics without distinction. The bull was afterwards extended and modified by several popes to include those who imposed taxes upon the clergy for the needs of the state, and in its latest form (promulgated by Urban VIII in 1627) specially anathematized all Hussites, Wickliffites, Lutherans, Calvinists, Unitarians, etc.; all schismatics, pirates who disturbed the papal seas, forgers of papal letters; all who should attack or conquer the papal territory, etc. The bull was annually promulgated at Rome till the year 1770, when a much modified document took its place, this in its turn being withdrawn by Pius IX in 1869.

Incombustible Cloth (in-kom-bus'-ti-bl), cloth rendered uninflammable by artificial means. This may be done by steeping the fabric in borax, phosphate of soda or ammonia, alum or sal-ammoniac; but these salts are not suitable for fine fabrics, and that which has been found to answer the purpose most effectually is tungstate of soda. A solution containing 20 per cent. of this salt, along with 3 per cent. of phosphate of soda, renders a fabric perfectly non-inflammable, and does not interfere with the ironing.

Income Tax, a tax levied directly from income of every description, whether derived from land, capital, or industry. The first income tax in Great Britain was imposed in 1799. The standard rate of tax in 1920 was 6*s.* in the £. For income tax in the United States see next article.

Income Tax in the United States.

The first income tax in the United States was levied in 1861-70, to aid in raising revenue during the Civil war. At first it was fixed at 3 per cent, but in 1865 was increased to 5 per cent, and the tax on all incomes over $10,000 was fixed at 10 per cent on the excess over $5000. It was repealed in 1870, the total sum raised in the ten years being nearly $365,000,000. A similar tax was enacted in 1894, but was ineffective, being declared unconstitutional by the Supreme Court. In 1909 a resolution was adopted by Congress providing for an amendment to the Constitution legalizing an income tax. This was finally ratified in 1913. The tax was one per cent on all incomes over $3000 (or over $4000 for married men). The rate was raised from one to two per cent in 1916 and a graduated super tax added on all incomes over $20,000.

By an Act of Congress, approved October 3, 1917, further additional taxes were imposed on incomes, a normal tax of two per cent. and a super tax of one per cent. on the excess over $5000 and not above $7500, two per cent. on that over $7500 and not exceeding $10,000. The progressive rate of interest continued till fifty per cent was levied on the excess of incomes over $1,000,000. The exemptions were reduced from $3000 to $1000 for a single person. and from $4000 to $2000 for a married person. By the War Income Tax of 1917 there was provided a tax on the incomes of corporations. (See *War Revenue.*) The Revenue Act of 1918, approved by the President February 24, 1919, imposed a tax of 6 per cent on the first $4000 of taxable income for 1918; 4 per cent for subsequent years. In addition to the normal tax there was levied a surtax ranging from 1 per cent for net income over $5000 and not over $6000 to 65 per cent for net income of $1,000,000 or over. The personal exemption was $1000 for a single person; $2000 for a married person.

In 1921 the personal exemption for a single person remained at $1000; but a married person was entitled to an exemption of $2500, on incomes up to $5000. An exemption of $400 was permitted for dependents. The normal rate of tax was 4 per cent on the first $4000 of net income above the exemptions, and 8 per cent on the remaining net income. This applied to citizens and residents of the United States. Alien non-residents were taxed 8 per cent on income received from sources within the United States. Non-resident aliens were allowed only a single personal exemption of $1000. The surtax rates remained unchanged for the calendar year 1921, but a material reduction was granted for the year 1922 and thereafter. The surtax rate for 1922 began at net incomes over $6000, on which the rate was 1 per cent; 2 per cent on incomes from $10,000 to $12,000, progressive rates of increase continuing to incomes of over $200,000. The surtax rate on all incomes over this amount was 50 per cent. Under the 1918 Act every corporation, not exempt, was subject to an income tax of 10 per cent for the years 1919 and 1920. Under the 1921 Act this tax was assessed at the rate of 10 per cent for the calendar year 1921, and 12½ per cent thereafter.

The number of persons who paid income taxes on $1,000,000 or over in 1916 was 206; in 1917 this had decreased to 141; in 1918 to 67; and in 1919 to 65, only 5 more than had been in the $1,000,000 income class in 1914. Those receiving an income of $1000 to $2000 in 1919 amounted to 1,924,872; those receiving $2000 to $3000, 1,569,741; $3000 to $4000, 742,334; $4000 to $5000 and $5000 to $10,000, about 438,000 in each class. See also *War Revenue.*

Incommensurable (in-kom - en'sū-ra-bl), in mathematics, a term applied to two magnitudes when they cannot both be measured by the same quantity, that is, when they do not contain it one or more times exactly, as the diagonal and side of a square.

Inconnu (Fr. unknown), a fish, usually called the Mackenzie River salmon, which in zoological character appears intermediate between the whitefish and the salmon. Its weight is usually about ten pounds, though much larger specimens at times occur. It was discovered by Alexander Mackenzie and named by his followers. As it is found in all the American and Asian rivers of the Arctic region it is of much importance to the natives of this section, despite the fact of its being an oily fish.

Increment (in'kre-ment), UNEARNED. This phrase first came into use in the Henry George system of land tax, in which it is claimed that much unimproved land is to be found in cities which has increased greatly in value as a result of improvements on surrounding land. This extra value is spoken of as the unearned increment, and it is claimed that it should be made subject to taxation sufficient to force the owners to improve their land. The phrase came in use again in 1909 as a feature of the Lloyd George budget of British taxation. He claimed that portions of the many landed estates of Britain had gained a large unearned increment of value through surrounding

improvements, and that this paid a very inadequate rate of taxation. His effort to tax this land at its true value met with vigorous opposition in the House of Lords, but the Lords were in the end obliged to pass the bill.

Incroyables (Fr. *Incredibles*). A name which, under the French Directory, was applied to a class of Parisian dandies, who made themselves conspicuous and to some extent ridiculous by their extravagances in dress, manner and speech. Among their peculiarities was the omission of the *r* sound in speaking. Their name was taken from their favorite expression, *Ma petite pa'ole d'honneu', c'est inc'oyable.* (Me wohd of honnah, it's incwedible.) This type of affectation has been known in France by various other names. The term has also been applied to the exaggerated style of hats which they wore.

Incubation (in-kū-bā'shun), in pathology the period between the introduction of the morbific principle and the outbreak of the disease. It is then gathering head in the system, and indicated only by such general symptoms as loss of appetite or sleep, etc. In epidemic and contagious diseases the period of incubation is well defined.

Incubation, the mode in which birds commonly bring forth their young, that of sitting on the eggs till they are hatched by the natural heat of the body. In general it is the female which undergoes the labor of incubation, but among some species, chiefly of monogamous birds, the male relieves the female while she seeks her nourishment; in others the male feeds her. Some birds, like the cuckoo, abandon their eggs to be hatched by others. In a state of nature birds generally commence to sit in spring. The time of incubation varies with different species, but is always the same with the same species. In the hummingbirds it is 12 to 14 days; in the swallow and lark, 15; the canary, from 15 to 18; crow, 20; common hen, 21; pheasant, partridge, etc., 22; peacock and turkey, 30; swan, 40-45; cassowary, 62.—*Artificial incubation,* the hatching of eggs by prolonged artificial warmth, has been long practised among the Egyptians and Chinese. Attempts have been made to carry out the artificial system on a considerable scale, both in America and England, and with remarkable success.

Incubator. The art of hatching eggs by artificial means was known to the Egyptians and Chinese at a very remote period. Brick ovens, heated with horse or camel dung, were used during four months of the year, while the annual product has been estimated at 75,000,000 chicks. Within recent times much improved methods have been devised, various ways of maintaining the requisite temperature being employed. The latest American incubators employ hot air. The advantages of hatching by artificial means are many, and a much larger number of chicks can be raised with much less care than where the hatching is done by hens.

Incubus (in'kū-bus), a spirit or demon, to whom was formerly ascribed the oppression known by the name of *nightmare.* These demons play a somewhat important part in the superstitions of the middle ages.

Incumbrance (in-kum'brans), any right or interest in land which may be held by third persons which diminishes the value of but not the right to pass title to such land. Examples of legal incumbrances are unpaid taxes, leases, mortgages, easements, mechanics' liens, private right of way, and so forth. The vendor of real estate is bound to disclose incumbrances and to deliver to the purchaser the instruments by which they were created or on which the defects arise. Failure to specify incumbrances, if such exist, gives the purchaser the right to reject the title and sue for damages. "Covenants for title" are covenants inserted in conveyances attesting that there are no incumbrances except such as may be specified.

Incunabula (in-kū-nab'ū-la), a term applied by bibliographers to editions of books printed during the early period of the art. It is generally limited to works which appeared previous to 1500.

Indemnity (in-dem'ni-ti), a term frequently employed in politics and jurisprudence. It is used in various significations, but is usually applied to an act of the legislature passed for the purpose of relieving individuals, especially in an official position, from the penalties to which they may have rendered themselves liable by some violation of the law whether by act or omission, or in case of members of government in consequence of exceeding the limits of their strict constitutional powers.

Indenture (in-den'tūr), a deed entered into between two or more parties, and so called because duplicates of every deed between two or more parties were once written on one skin, which was cut in half, with a jagged or indented edge, so that they were seen to belong to one another. See also *Apprentice.*

Independence a city, county seat of Montgomery Co., Kansas, on the Verdigris River, 170 miles s. of Kansas City. It is an oil and gas

THE SIGNING OF THE DECLARATION OF INDEPENDENCE
From the Original Painting by John Trumbull in the Capitol at Washington.

center, headquarters of several operating companies, and is the largest shipping point on the Santa Fé and Missouri Pacific railroads. Has numerous gas and oil plants, cement works, iron works, brick plant, etc. Pop. 11,920.

Independence, a city, county seat of Jackson Co., Missouri, 10 miles E. of Kansas City, in a fruit and grain-growing and stock-raising section. It has machine shops, cement and flour mills, etc. Pop. 11,686.

Independence Day, a holiday held in the United States on the 4th of July, this being the day in 1776 in which the Declaration of Independence was adopted by Congress.

Independence Hall, the old State House of Pennsylvania, built on Chestnut Street, Philadelphia, 1732–41, and occupied by the Congress of the new republic when independence was declared, July 4, 1776. It is now regarded as the Mecca of American patriotism. It is a fine example of colonial architecture and has recently been restored to its original condition. In it is kept as a sacred relic the famous Liberty Bell, with its significant motto, 'Proclaim liberty throughout all the land to all the inhabitants thereof.' It contains numerous historic portraits.

Indeterminate (in-de-tér'min-āt), in mathematics, having an indefinite number of values or solutions. *Indeterminate analysis* is a branch of algebra in which there are always given a greater number of unknown quantities than there are independent equations, by which means the number of solutions is indefinite.

Index Librorum Prohibitorum ('list of prohibited books'), in the Roman Catholic Church, a title used to designate the catalogue or list of books prohibited by ecclesiastical authority, on account of the heretical opinions supposed to be contained in them, or maintained by the authors or editors of them: when the list or catalogue is of books allowed to be read after correction or alteration, agreeably to the orders of the Papal authorities, it is termed *Index Expurgatorius*. Such prohibitory catalogues have been in use from a very early period in the history of the church, commencing with a list of prohibited books drawn up by a council held at Rome in 494, or even earlier with the proscription of the writings of Arius. These prohibitions, in fact, were often issued by other than the Papal authorities. In 1408 a synod at London prohibited the reading of the books of Wickliffe. In 1544 the Faculty of Theology in Paris published a catalogue of books censured by them, and in 1546 the University of Louvain published an index of books regarded as dangerous. The indexes of the church were a subject of consideration at the Council of Trent, which referred the business of drawing up a complete index to a select committee under the pope. Their Index was published in 1564, and besides the catalogue of prohibited books contains general rules relative to such books. In 1586 a special ecclesiastical board, the Congregation of the Index, was formed, consisting of a cardinal-prefect, with other cardinals and examiners of books, with authority to judge of new works, to indicate those of which the reading is entirely prohibited, and those which are permitted after correction, and also to grant to learned and pious men the right of reading prohibited works. The most important editions are those of Alexander VII in 1664, and of Benedict XIV in 1758. The latest edition appeared in 1900, according to rules of 1897. In 1607 the first volume of an Index Expurgatorius was published at Rome, edited by the Dominican Brasichelli. In Spain the Inquisition maintained its right to issue its own index, the last edition of which, dated 1790, was reprinted, with a supplement in 1805. The Spanish indexes are mostly both prohibitorial and expurgatorial.

Index Expurgatorius. See preceding article.

India (in'di-a), a name properly applicable to the whole of the British Indian Empire, which includes Burmah (which see), but popularly restricted to the great central peninsula of Southern Asia. It forms an irregular triangle, insulated from the rest of Asia by the almost impassable ranges of the Himalayas, the Hindu-Kush, and Suleiman Mountains, and by the Indian Ocean. Its length north and south, and its greatest breadth east and west, are both about 1900 miles. Within these borders is an area of about 1,773,168 sq. miles, with a population (1911) of 315,156,396. India may be regarded as consisting of three separate regions, well defined by differences of soil, climate, productions, and population. The first is the region of the Himalayas. Immediately south of the Himalayas lies the vast North Indian Plain, containing the most fertile and densely-populated portions of the empire. South of the northern plain rises the third region of India, the triangular plateau of the Deccan, which has a general elevation of from 2000 to 3000 feet. Its northern scarp is formed by a number of hill ranges known as the Vindhya

Mountains. The other two sides of the Deccan are formed by the Eastern and Western Ghâts, which stretch southwards along the eastern and western coasts of India, the latter rising in the Nilghiris or Neilgherries to the height of 8760 feet. (See *Ghâts.*) The vast North Indian plain is watered by three distinct river systems, which collect the drainage of both the northern and southern slopes of the Himalayas. The first of these systems rises on the northern side of the Himalayas, and makes way through their western ranges into the Punjab as the Indus and Sutlej. The second rises in the same quarter, not far from the sources of the Indus and Sutlej, but flows in an opposite direction, and enters India on the east as the Brahmaputra of Assam and Eastern Bengal. As these two systems convey to India the drainage of the Tibetan slopes of the Himalayas, so the third system, the Ganges, with its tributary the Jumna, drains the southern slopes; traverses the central part of the Indian plain; unites near its mouth with the Brahamaputra and forms the immense delta known as the Sunderbunds. The Ganges for thousands of years has occupied a prominent place in Indian civilization, and was the sole channel of traffic between Upper India and the seaboard until the opening of the railway system in 1855. In the Deccan the Nerbudda and Tapti carry the drainage of the southern slopes of the Vindhyas into the Gulf of Cambay; and the Godavari, the Kistna (Krishna), and Cauvery rise in the Western Ghâts, and traverse the whole of the central table-land, reaching the sea on the eastern shores of the peninsula. The Indian rivers in the lower portions of their courses afford a natural system of irrigation, but in the higher parts an extensive system of canal irrigation is required. The Ganges and Jumna canals alone irrigate an aggregate area of about three million acres. The coasts of India have very few indentations, and consequently few good natural harbors. There are no lakes of any extent, Chilka and Kolair on the east coast being the largest.

Climate.—In Southern India the climate, of course, is tropical, and generally the heat is very great. Among the higher elevations of the Himalayas an Alpine climate prevails. The Indian plains are, especially in summer, sultry, unhealthy, and partly barren. The Deccan and the slopes of the Himalayas enjoy a temperate climate. The climate of the Nilghiris is healthy and pleasant, and several sanatoria for Europeans have been established there, as well as on the Himalayas. Throughout the entire country there are only two annual seasons, the dry season and the rainy season. The rainfall depends upon the monsoons. On the western coast the rainy season begins with the southwest monsoon, and lasts from May till November; on the east coast the rainy season, following the southeast monsoon, lasts from November till March. The rainfall, however, is distributed with great irregularity.

Botany and Zoology.—The flora of India offers nothing very distinctive. In the Himalayas it has to a considerable extent a European character; in the south it is tropical. Many plants of temperate climates, such as wheat, barley, European vegetables, etc., are grown in the northwestern and other parts, while various products of warmer regions are also cultivated, such as cotton, rice, indigo, oil-seeds, jute, tobacco, sugar-cane, cocoanut, date and other palms, spices, etc. Coffee, tea, and cinchona, though of recent introduction, are now extensively cultivated in India, the first particularly on the slopes of the Western Ghâts and in the Nilghiris. The tea-plant is also grown in the south, but especially in Assam and along the lower slopes of the Himalayas. European fruits abound, and among cultivated fruits may be mentioned the mango, plantain, pomegranate, citron, orange, lime, melon, fig, almond, pineapple, guava, jack, and tamarind. Among trees the teak forests under the protection of the government are of most economic value. The bamboo, the banyan, the sappan, the saul, etc., are all characteristic of Indian forest scenery. In Bengal and some other parts the natives live chiefly on rice, but millet is the staple food, grain, barley, wheat, with sweet potatoes, onions, garlic, etc., being also largely found. Opium is cultivated in Bahar, Benares, and Malwa. The vast forests of India are tenanted by great numbers of wild animals, birds, and reptiles. Large herds of elephants are still met with in Nepaul, Eastern Bengal, and the Nilghiris; the bear, the wild boar, and rhinoceros chiefly in the woods of the Eastern Himalayas; the tiger is found in every part of the country; the lion is now almost extinct. Other carnivorous mammals are the leopard or panther, cheetah, wolf, fox, jackal, and hyena. Several antelopes and deer, wild sheep and goats, the wild ass, the great gaur ox or 'bison,' the wild buffalo, are among the fauna. Snakes and reptiles in all varieties are very numerous, and the cobra and other poisonous snakes cause numerous deaths. Among domestic animals are oxen, camels, horses, mules, sheep and goats. Of birds, eagles,

vultures, the peacock, parrakeets, the adjutant-bird, etc., are characteristic species. Fish are plentiful and in great variety.

Minerals.—India is richly endowed with minerals; hardly a single metal seems to be wanting; but they are not worked to any extent. Coal, iron, and salt receive most attention.

Divisions, Administration, and Population.—In 1858 the administration of the British possessions in India, long held by the East India Company, was transferred to the crown, and in 1877 the British queen assumed the title of Empress of India. The British provinces consist of Madras, Bombay, Bengal, United Provinces of Agra and Oudh, Punjab, Burma, Bihar and Orissa, Central Provinces and Berar, Assam, Northwest Frontier Province, Ajmer-Merwara, Coorg, Baluchistan, Delhi, and Andaman and Nicobar islands. The administration of the Indian Empire in England is entrusted to a Secretary of State for India, assisted by a council of 8 to 12 members. The supreme executive authority in India is vested in the Governor-General in Council, often styled the Government of India. The Governor-General, or Viceroy, is appointed by the Crown, and usually holds office for five years. The capital of the Indian Empire and the seat of government was moved from Calcutta to Delhi in 1912, Delhi being formed into a separate territory.

Under the government of India act, 1919-20, the various functions of government were classified as Central and Provincial subjects, the latter being committed to the Provincial governments, while such subjects as the collection of income tax are to be dealt with by the Provincial governments at the discretion of the Central government. The Provincial governments, consisting of an executive council and a legislative council, are based upon a scheme of diarchy, or dualized form of government. Official acts are carried out by the governor-in-council, while on the popular side the government consists of the governor and of ministers who are elected members of the legislative council.

The total area of British India is 1,093,074 square miles; pop. 244,267,000. Native states, 709,255 square miles; pop. 70,889,000. Total area of India, 1,802,629 sq. miles; total pop. 314,156,000.

Revenue, Money, Weights, etc.—The total revenue to the budget-estimate of year 1910 was £74,375,000 (calculating the rupee at 1*s.* 4*d.*, for its actual value has not exceeded 1*s.* 5*d.* for some years), and the expenditure about the same. The public debt is estimated at £267,200,000. The chief source of revenue is the land-tax, which yields from £20,000,000 to £23,000,000 annually. About 70 per cent. of the population are engaged cultivating the soil, while only about 3 per cent. reside in towns of over 50,000 inhabitants. Opium, which forms a government monopoly, and salt, on which considerable duty is levied, are the other two important sources of revenue. The chief currency in India is silver, but the mints were recently closed. A government paper currency was introduced in 1861. Circles of issue with subordinate agencies were established in the chief towns; and notes from 5000 to 10,000 rupees were made a legal tender within the circle. The chief money denomination is the *rupee*, which is divided into 16 *annas*, the anna again being equivalent to 4 *pice*. The primary standard of weight, called the *ser*, is equal to the French kilogramme, or 2.205 lbs. A weight in common use is the *maund*, in Bengal 82 lbs., in Bombay 28 lbs., in Madras 25 lbs. By an act passed in 1889 the imperial yard is made the standard measure of length.

Communications, Trade, etc.—Some of the irrigation canals as well as the rivers supply means of internal navigation, but the construction of railways has been the most important step taken to render the internal communications of India permanently efficient. A considerable portion of the railway system was constructed by companies on whose capital interest at the rate of 5 per cent. was guaranteed by government. Government, however, no longer entrusts the railways to private enterprise, and all lines sanctioned by it are now constructed by the State. The total sanctioned mileage open and under construction in 1910 was about 32,000 miles. There were 70,000 miles of telegraph line. The imports, including bullion and specie, for year ending March, 1910, amounted to about £100,000,000, and the exports to £107,000,000. About half the imports consist of cotton goods; the exports comprise cotton, opium, oil-seeds, rice, wheat, jute, indigo, tea, cotton goods, etc.

Inhabitants, Languages, etc.—India has been peopled by several races which have now become more or less mixed. The Hindus, who are partly of Aryan or Indo-European origin (see *Indo-European Languages*), partly of non-Aryan origin, are by far the most numerous. In the south dwell people of a non-Aryan and Dravidian stock; and the remainder is made up of Arabs, Parsees, Mongolians, etc. The Europeans number over 125,000, and in addition there are about 110,000 Eurasians, *i.e.* the progeny of Hindus and Europeans. Of non-Aryan languages there are about 150 dialects.

The Dravidian languages, the chief dialects of which are the Tamil, Telugu, Kanarese, and Malayalam, are spoken by about 28 millions of people in Southern India. The principal of the modern Aryan vernaculars derived from the ancient Sanskrit and Prakrit are Hindi, Marathi, Punjabi, Bengali, Uryia, Sindhi, and Gujerati. Hindustani, a corrupted form of Hindi filled with Persian and Arabic words, is the language of the Mohammedan conquerors of India, and has been adopted as the official language and means of general intercourse throughout the peninsula. The leading religion is Brahmanism, the professed creed of the majority of the Hindus and the religion most distinctive of India. It reckoned 207,731,727 adherents in 1901. Large numbers in the north and northwest are Mohammedans (62,000,000). Buddhists number about 9,000,000; Parsees or Fire-worshipers 100,000; Sikhs 2,000,000. Among the Hindus the caste system still prevails. (See *Brahmanism.*) European missionaries have long been active, but only a mere fraction of the people are as yet Christians, about 3,000,000. Education is now making good progress, schools and colleges of all kinds having been established throughout the country. The pupils, however, number only a few millions. There are universities (examining bodies only) at Calcutta, Bombay, and Madras, besides other two at Lahore and Allahabad.

History.—The early history of India is obscurely written in the myths of Sanskrit literature, but the first fact of any certainty is that about the year 2000 B.C., or even earlier, an Aryan people of comparatively high civilization descended from the mountain regions of the northwest into the plains of India, where they subdued the original inhabitants. The expedition of Alexander the Great to the Indus in B.C. 326 gives us a momentary glimpse of that part of India; but up to the time of the Mohammedan conquest there is little authentic political history of India. In the third century B.C. Buddhism was established throughout India, but it afterwards entirely gave way to Brahmanism. The first six centuries of the Christian era were occupied by struggles between the native dynasties and invaders from the northwest. In the eighth century the tide of Mohammedan conquest began with Kasim's advance into Sind (711 A.D.). But the Mohammedans were again driven out in 828, and for more than 150 years afterwards the strong feudal and tribal organizations of the northern Hindu kingdoms were a barrier to the Mussulman advance. At length in the year 1001 Mahmud of Ghazni reduced the Punjab to a province of Ghazni, and the Mohammedan power was gradually extended into Southern India. In 1398 Timur or Tamerlane led a great Mogul (or Mongol) invasion of India, and after sacking Delhi retired into Central Asia. In 1526 Sultan Baber, a descendant of Tamerlane, founded the Mogul Empire in India. His grandson Akbar reigned from 1556 to 1607, and extended his power over most of the peninsula, being distinguished by his justice and his tolerance in matters of religion. His son Jehanghir received an ambassador from James I, of England, in 1615. During the reign of his successor, Shah Jehan, famous for his architectural magnificence, the Mahrattas began to be formidable in Southern India. Shah Jehan was deposed in 1658 by his youngest son Aurengzebe, who made war successfully with the Afghans, the Rajputana tribes, and the rising power of the Mahrattas. The Sikhs, a Hindu sect, formed a religious and military commonwealth in the Punjab in 1675. On the death of Aurengzebe, in 1707, the Mogul empire began to decline, Mohammedan viceroys like the Nizam and the ruler of Oudh asserting their independence, while the great Hindu states of the Sikhs, the Rajputs, and the Mahrattas began to harass the decaying empire. In 1738 Nadir Shah of Persia swept down on Hindustan, sacked Delhi, and carried away sixty millions sterling of treasure. The two immediate successors of Aurengzebe, Bahadur Shah and Jahandar Shah, were incapable rulers, practically under the control of the vizier Zulfikar Khan. The three following were mere names under cover of which Husain Ali, governor of Behar, and Abdulla, governor of Allahabad, controlled affairs. During the reign of Mohammed Shah the Mahrattas, who had already subdued the Deccan, wrung first Malwa (1743) then Orissa (1751) from the feeble grasp of the Mogul emperor. The same year saw the first inroad of the Afghan prince Ahmed Shah, followed in quick succession by other three invasions, to repel which the assistance of the Mahrattas was obtained. In 1761 the decisive battle of Panipat was fought between the Afghans and the Mahrattas, and ended in the defeat of the latter. The victor, Ahmed Shah, still recognized the Emperor Shah Alam, but the dignity was little more than nominal. Shah Alam was succeeded in 1806 by Akbar II, who was succeeded in turn by Mohammed Bahadur Shah, the last Mogul emperor, who died at Rangoon a British state prisoner in 1862.

In the beginning of the sixteenth cen-

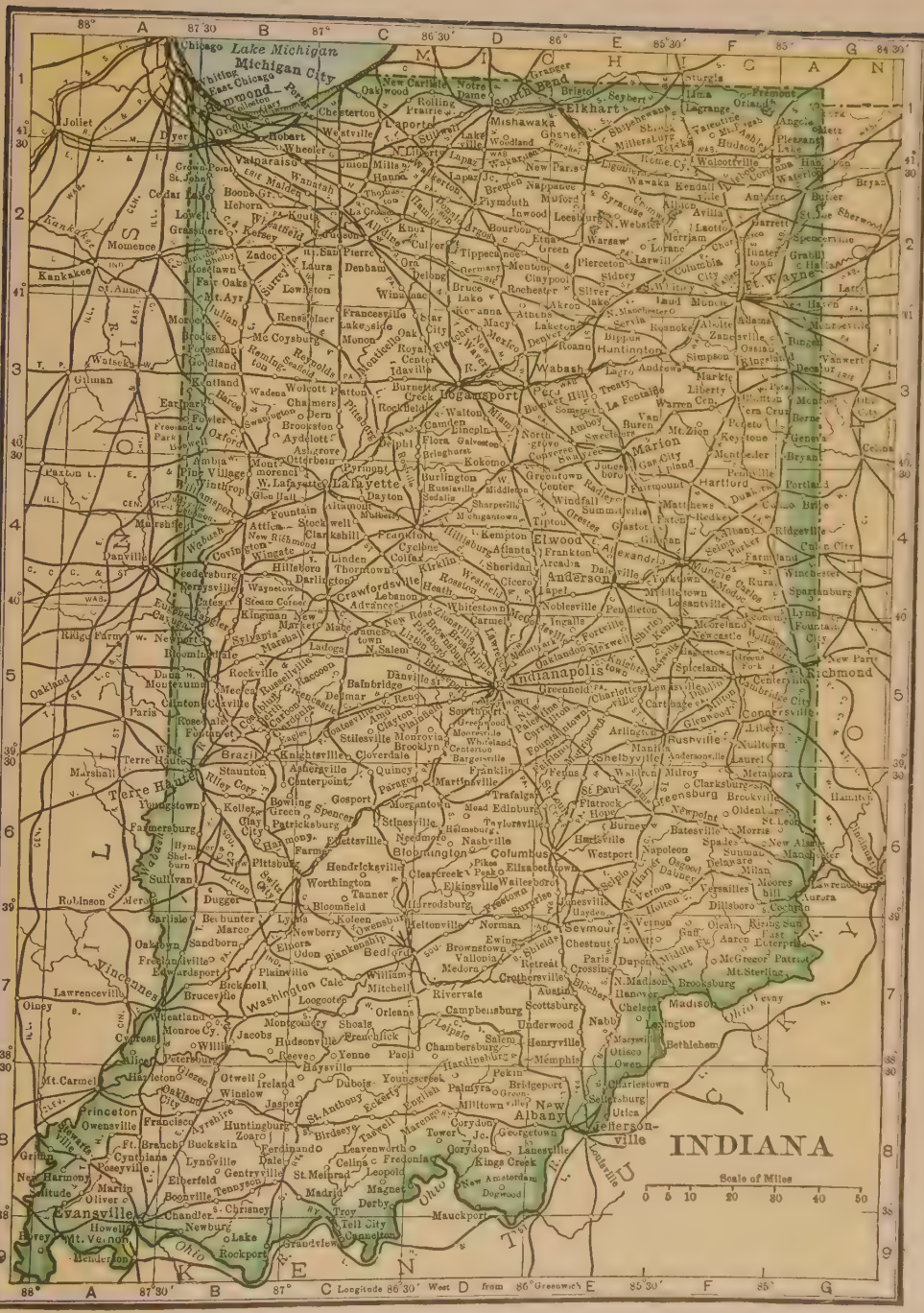
tury the Portuguese, following the wake of Vasco da Gama, had established factories and fortresses on the coasts of Malabar, and soon extended their power over nearly all the ports and islands on the coasts of Persia and India. In 1595 the Dutch gained a footing in India. The English East India Company began its commercial settlements in India in 1613, Surat being the chief station. (See *East India Company.*) A grant of a small territory around Madras was received from the Rajah of Bijnagar in 1639, on which was erected the fort of St. George. Madras became a presidency in 1654. Calcutta, ultimately the seat of government in India, was settled in 1690, and became a presidency in 1707. The English early came into collision with the Portuguese and Dutch, but it was the struggle with the French in India, whose first settlements were founded in 1604, for influence over the native princes, that led step by step to the establishment of the British empire in India. The first conflict with the French took place in 1746, when the English lost Madras, which was, however, restored by the treaty of Aix-la-Chapelle. In 1751 Dupleix, the French governor at Pondicherry, was powerful enough to place creatures of his own on the thrones of the Deccan and the Carnatic. The English supported rival candidates, and the result was a second war, which left English influence predominant in the Carnatic, though the French still controlled the Deccan. The most memorable incident in this war was Clive's capture of Arcot. About this time important events took place in Bengal, then a subordinate presidency to that of Madras. The Nawab of Bengal, Sirâj-ud-Daulâ (Surajah Dowlah), attacked the English settlement at Calcutta with a large army, forced it to capitulate, and thrust the prisoners, to the number of 146, into the Black Hole or common prison of the garrison, a room 18 feet square, with two small windows. After a night of unparalleled suffering only twenty-three were found alive in the morning. Clive was at once sent with an armament from Madras, recovered Calcutta, attacked and took the French settlement at Chandernagore, routed the Nawab's army at the battle of Plassey (June 23, 1757), and placed Mir Jaffier on the vice-regal throne, with consent of the Mogul court. In the south the English were equally victorious. A force despatched by Clive took Masulipatam, and the victory gained by Coote at Wandewash on January 22, 1760, completed the destruction of the French power in India.

In Bengal Mir Jaffier soon found himself unable to meet the exorbitant claims of his allies, and in 1760 he was deposed in favor of his son-in-law, Mir Kasim, who agreed to pay the balance due by Mir Jaffier as well as grant the districts of Burdwan, Midnapore, and Chittagong to the English. But disputes soon led to a war, in which Mir Kasim was worsted and forced to flee. The British retained the collectorship or fiscal administration of Bengal, Behar, and Orissa, under the fiction of a grant from the Mogul emperor. A nominal native ruler, however, was still appointed in the shape of a nawab, who received an allowance of £600,000, and the actual collection of the revenues was still left to the native officials. This system of double government established by Clive was abolished in 1772 by Warren Hastings, who appointed English officers to collect the revenues and preside in the courts, and thus laid the foundations of the present system of British administration in India. In 1774 Hastings was made governor-general of India. Among the notable measures of his vigorous rule were the refusal of the £300,000 of the Bengal tribute to the Mogul emperor, the sale of the provinces of Allahabad and Kora (assigned by Clive to the emperor in 1765) to the nawab of Oudh, and the loan of British troops to the same nawab for the subjection of the Rohilla Afghans. For these and other acts, such as the extortion of heavy fines and forfeitures from the Begum of Oudh and the Rajah of Benares, Hastings was impeached on his return to England. (See *Hastings.*) In 1778 the intrigues of the Bombay government led to the first war with the Mahrattas, in which the British arms were only saved from disgrace by the achievements of the Bengal army which Hastings sent to the aid of the other presidency; and in the war with the Sultan of Mysore the diplomatic skill of Hastings, and the valor of the Bengal troops under Sir Eyre Coote, again won victory for the British. In 1786 Lord Cornwallis succeeded Hastings as governor. His rule is memorable chiefly for the war with Tippoo, Sultan of Mysore, which terminated in the sultan having to surrender one-half of his dominions to the British and their allies. Sir John Shore succeeded as governor-general in 1793. He was followed by the Marquis of Wellesley, who arrived in 1798, and whose policy eventually made the British power paramount from the Himalayas to Cape Comorin. Under him Tippoo of Mysore was completely overthrown (1799) and the second Mahratta war successfully concluded, Sir Arthur Wellesley (afterwards Duke of Welling-

ton) having won the victory of Assaye September 23, 1803), and General Lake that of Laswaree (November 1, 1803). In 1805 Lord Cornwallis went out as governor-general for the second time. He died soon after his arrival, and was succeeded by Sir George Barlow, and he by Lord Minto in 1807. In 1809 some disturbances at Travancore and Cochin led to these regions being placed under British control. During the governorship of the Earl of Moira (Marquis of Hastings, 1814-23) there was a war with the Goorkhas of Nepaul, which after a short struggle ended with the cession to the British of Kumáon; and another with the three great Mahratta princes, the Peshwá of Poona, the Rajah of Nágpur, and Holkar of Indore. The Peshwá's territory was annexed; the other Mahratta princes were compelled to accept alliances placing them under British protection. A new province, the nucleus of what are now the Central provinces, was formed out of territory recovered from the Pindárís. In 1823 Lord Amherst succeeded as governor-general. During his administration the first Burmese war arose, and was concluded in 1826 by the cession to the British of the provinces of Aracan and Tenasserim. Under Lord William Bentinck's rule (1828-35) administrative reform and the moral elevation of the peoples of India were chief subjects of consideration. In 1836 Lord Auckland assumed the governorship. Two years later the Afghan war broke out, and terminated in the disastrous British retreat. (See *Afghanistan.*) During Lord Ellenborough's administration Sind was annexed. Sir Henry (afterwards Lord) Hardinge succeeded in 1844, and the year following the Sikhs, originally a religious sect who had conquered the Punjab, crossed the Sutlej in great force. Four hotly-contested battles, at Mudki, Firozshah, Aliwál and Sobráon, left the British masters of the field. Part of the Sikh territory was annexed, and the infant Dhuleep Singh recognized as rajah of the rest. During the governor-generalship of the Earl of Dalhousie, 1848-56, a new war broke out with the Sikhs, and after their final defeat by General Gough at Gujerat, February 21, 1849, the Punjab was annexed to the British dominions. This was immediately followed by the second Burmese war, ending in the annexation of Pegu, June 20, 1853. The Indian states of Sattara, Jhansi, and Nágpur were, on the failure of the native succession, annexed to the British possessions, 1852-56, and Oudh was also brought directly under British rule. During the same administration the extensive scheme of Indian railways and telegraphs and steamship connection with Europe *via* the Red Sea was planned and inaugurated, the Ganges Canal opened, and the Punjab Canal begun.

The administration of Viscount Canning (1856-61) was distinguished by a short war with Persia, and especially by the great Sepoy mutiny. Several outbreaks among the native soldiers took place during March, 1857. The first formidable revolt, however, was at Meerut on May 10th, where the Sepoys of the 3d Light Cavalry, assisted by the 11th and 20th Regiments of infantry, rose and massacred the Europeans. They then fled to Delhi, where they were immediately joined by the native garrison. Here another massacre took place, and the dethroned descendant of the Moguls once more assumed the sovereignty. The revolt spread rapidly through the Northwestern Provinces and Oudh, down into Lower Bengal. Only in the Punjab the prompt measures of the governing officials in disarming the Sepoys prevented an outbreak, and the Sikh population continued steadily loyal. Wherever the mutiny broke out it was attended with savage excesses; women were outraged, and Europeans without distinction of age or sex barbarously murdered. At Cawnpore the revolted Sepoys were headed by Nana Sahib, the heir of the last Peshwá of the Mahrattas. After a heroic but fruitless attempt to defend themselves, the Europeans capitulated on the sworn promise of Nana Sahib to allow them to retire to Allahabad. On May 27th the survivors, about 450 in number, were embarking when they were attacked by the Nana's troops, and the men indiscriminately massacred. The women and children, 125 in number, were carried back to Cawnpore and kept till the 15th of July, when they were all cut to pieces on the approach of Havelock's army. Cawnpore was stormed the day following. At Lucknow Sir Henry Lawrence had the foresight to fortify and provision the Residency, where the garrison held out till relieved by Havelock and Outram on September 25th. But Havelock was in turn besieged, and was with difficulty relieved (November 17) by Sir Colin Campbell, afterwards Lord Clyde. Delhi, meanwhile, had fallen, chiefly owing to the skill and valor of Sir John Lawrence. By May, 1858, when Bareilly was taken, Sir Colin Campbell and Sir Hugh Rose had restored order, and the mutiny was at an end.

In 1858 the direct sovereignty of India, and the powers of government hitherto vested in the East Indian Company, were


INDIANA
Scale of Miles
0 5 10 20 30 40 50
Indianapolis
Lafayette
Terre Haute
Evansville
Fort Wayne
South Bend
Gary
Hammond
Michigan City
Lake Michigan
Richmond
Anderson
Muncie
Kokomo
Logansport
Marion
Elwood
Alexandria
Connersville
Greensburg
Shelbyville
Columbus
Bloomington
Vincennes
Washington
Jeffersonville
New Albany
Madison
Aurora
Lawrenceburg
Rushville
Greenfield
Noblesville
Peru
Wabash
Huntington
Warsaw
Elkhart
Goshen
Plymouth
Rochester
Logansport
Crawfordsville
Lebanon
Frankfort
Kokomo
Peru
Marion
Muncie
Anderson
Richmond
Connersville
Shelbyville
Greensburg
Seymour
Columbus
Bloomington
Vincennes
Washington
Jeffersonville
New Albany
Madison
Aurora
Lawrenceburg
Rushville
Greenfield
Noblesville
Wabash
Huntington
Warsaw
Elkhart
Goshen
Plymouth
Rochester
Crawfordsville
Lebanon
Frankfort
Elwood
Alexandria
Connersville
Greensburg
Shelbyville

vested in the British crown. Lord Canning returned to England early in 1862, and was succeeded by the Earl of Elgin, who died in 1863. Sir John (afterwards Lord) Lawrence was governor-general from 1863 to 1868, when he was succeeded by the Earl of Mayo, who did much to develop the material resources of the country by removing the restrictions upon trade between the different provinces, and constructing roads, canals, and railways. He was assassinated by a Mohammedan fanatic in the Andaman Islands, February 8, 1872. Lord Northbrook became viceroy in 1872. During his administration a famine in Lower Bengal, successfully obviated by a vast organization of state relief (1874), the dethronement of the Gaekwâr of Baroda for disloyalty (1875), and the tour of the Prince of Wales through India (1875-76), were the chief events. In 1876 Lord Lytton was appointed viceroy, and on January 1, 1877, Queen Victoria was proclaimed Empress of India at Delhi. In 1877-78 a most disastrous famine occurred, and despite the most strenuous efforts of the government over five million persons are said to have perished. In 1878 the intrigues of Shir Ali, amir of Afghanistan, with Russia, led to a declaration of war on the part of the British. After two campaigns Abdurrahman Khan was established on the Afghan throne by British arms. (See *Afghanistan.*) The viceroys of late date include Lord Ripon, 1880; Lord Dufferin, 1884; Marquis of Lansdowne, 1888; Earl Elgin, 1893; Lord Curzon of Kedleston, 1898; Earl Minto, 1905; Lord Hardinge, 1910; Lord Chelmsford, 1916; Baron Reading, 1921. In the European war (1914-18) the native princes loyally supported the British armies. British and native troops from India numbered 1,215,338.

India Matting, a matting woven from the stems of *Papyrus Pangorei* or *corymbosus,* and chiefly exported from Bengal.

Indiana (in-di-an'a), one of the United States, bounded by Michigan lake and state, Ohio, Kentucky, and Illinois. It is almost one continued plain, with the exception of the hills of the Ohio River and Wabash valleys, which rise from 200 to 600 feet above the sea-level, the highest elevation being 1250 feet. The western side of the state, north of the Wabash, is mostly prairie land interspersed with lakes, woodlands, and swamps. The eastern part was originally thickly covered with forests. The soil varies from a deep black sand to clay loam and is generally fertile, nearly one-eighth of the area being open prairie and well adapted to agriculture. Indian corn, wheat, oats, barley, tobacco, and potatoes are the chief agricultural products. Molasses, cidar, wine, honey, cheese, milk are also plentifully produced. Immense herds of cattle and swine are reared, and slaughtering and meat packing is one of the leading industries. Between the Wabash and the Ohio there is a coalfield of nearly 7000 square miles, with a coal of excellent quality, and an output which in 1912 amounted to about 14,000,000 tons. The other chief mineral products include petroleum, natural gas, limestone, sandstone and cement, both Portland and natural rock. The natural gas product was large, but is now practically exhausted. The natural resources of the county have helped to develop the manufactures, which include flour and grist-mill products, foundry and machine shop products, iron and steel products, liquors, etc. Petroleum also yields a large product. The White Water, White River and Wabash are the principal rivers. Water transportation is fairly good. Lake Michigan furnishes an outlet to the north, the Ohio River to the south. The railroads have a length of more than 7000 miles. The principal cities are Indianapolis (the capital), Fort Wayne, Evansville, South Bend, Terre Haute, Gary, etc. The Indiana University (founded 1824, 2500 students) is at Bloomington. Indiana was part of the territory ceded by the French to the British in 1763, and by the British to the U. S. in 1783. It was admitted into the Union in 1816. Pop. (1900) 2,516,462; (1910) 2,700,876; (1920) 2,930,390.

Indiana, a borough, county seat of Indiana Co., Pennsylvania, 46 miles N. E. of Pittsburgh. It is the trading center of a coal-mining district, and has large glass works, flour and saw mills, woodenware and enameling factories, etc. Pop. (1920) 7043.

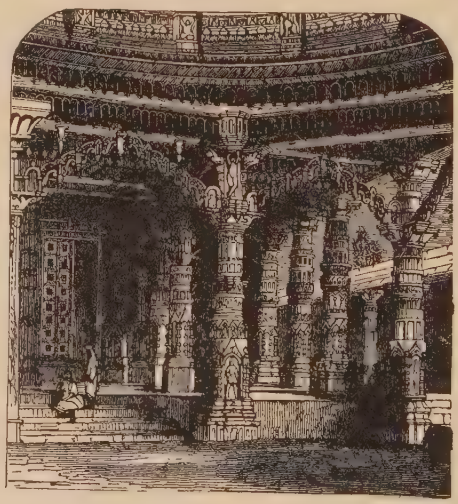
Indianapolis (in-di-an-ap'ō-lis), the capital of Indiana, on the White River, near the center of the State, situated on a plain. It is the center of numerous railroads, and being surrounded by rich agricultural and mineral regions is a place of great trade and manufactures. It is an important market for grain, livestock, timber, etc., and carries on meat packing, the production of automobiles, agricultural implements, woolens, flour, etc. The city has many fine buildings, notably the Capitol, Court House, Federal Building, etc. Educational and benevolent institutions are numerous. The first settler appeared in 1820, and in 1824 the city became the State capital. Pop. (1910) 233,650; (1920) 314,194.

Indian Archipelago. See *Malay Archipelago.*

Indian Architecture, comprehends a great variety of styles, among which we may distinguish, as the most important, the Buddhist style, the Jaina style, the Dravidian or style of Southern India, the Chalukyan style, the Modern Hindu or Indian-Saracenic style. The history of Indian architecture commences in the third century B.C., with the religious buildings and monuments of the Buddhists.

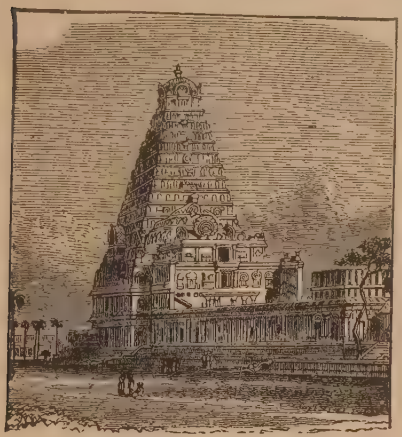
Buddhist Great Tope at Sanchi, Central India.

Among the principal forms of BUDDHIST ARCHITECTURE are the following:—First, the *topes, stupas,* or towers built to mark some sacred spot, and the *dagobas,* constructions of a similar nature, containing relics of Buddha or Buddhist saints. These buildings generally consisted of a circular stone basement varying from 10 or 12 to 40 feet in height, and from 40 to 120 feet in diameter, on which rose a rounded domical structure, generally of brick or small stones laid in mud, the whole edifice rising sometimes 50, sometimes 100 feet high. (See *Dagoba, Tope.*) Second, the rock-cut *chaitya halls* or churches, and the *viharis* or monasteries. Most of these are found in the Bombay Presidency; some also in Bengal and Behar. In rock-cut buildings architectural skill is confined to the façade and the interior, which are generally cut out with most beautiful and perfect detail. Among the most notable for beauty of design are those at Ajanta, and finest and largest of all, the great Chaitya cave at Karli, near Bombay, the date of which is probably about 80 B.C. Another interesting example is at Ellora (which see). The JAINA STYLE is a development or corruption of the pure Buddhist. It is characterized by the square or polygonal court, the twelve-pillared dome, the slenderness and elegance of the columns, the horizontal arch, the *sikras* or towers surmounting the cells containing the images, and, lastly, by the peculiar grouping of many temples together on hilltops. Prominent examples of Jaina architecture are found at Girnar in Gujerat; and at Mount Abu, of the Aravulli range. The DRAVIDIAN STYLE is that of the peoples of Southern India. Its most flourishing epoch comprises the sixteenth, seventeenth, and even eighteenth centuries of our era. To this late period belong the great temples at Tanjore, Tiruvalur, etc. The distinctive parts of a Dravidian temple are the *vimana* or temple proper, with storied pyramidal roof; the *mantapas* or porches, covering the door which leads to the cell; the *gopuras* or gate-pyramids, in the quadrangular enclosures surrounding the vimanas; the *choultries* or pillared halls, used for various purposes. The general characteristics of a Dravidian temple of the first class are the storied pyramidal towers, the hall of 1000 columns, the bold cornice with double flexure, the detached shafts, the richly-carved stylobate, and the large tanks with flights of stone steps. The CHALUKYAN STYLE, so named from a dynasty which rose in the sixth century, in what is now Mysore and the



Vimala Sah Jain Temple, Mount Abu—Jaina style.

Nizam's Territory, reached its perfection in Mysore from eleventh to fourteenth centuries. The characteristic features are the open porch, the straight-lined, conical-



The Great Pagoda, Tanjore—Dravidian style.

shaped tower, the star-shaped temple, and the basement terrace of stone. The INDIAN-SARACENIC STYLE is a general name for a number of somewhat varying styles, the result of the mixture of Saracenic principles of architecture, brought with them by the Mohammedan conquerors of India, and the distinctive architectural features of the different localities where they settled. Under the Mogul emperors in the sixteenth century were erected some most magnificent buildings, such as the tomb of Humayun Shah at Old Delhi; that of Akbar at Secundra (see *Akbar*); the palaces of Shah Jehan at Agra and Delhi; and the famous and most beautiful Taj Mahal, built by the same monarch at Agra. The Moslem architecture of India contrasts with the native Indian styles in its use of the radiating arch, in the superior simplicity and grandeur of its style—its flat ornamentation not interfering with the lines of true architectural construction. A characteristic feature also is its fine conventionalism of vegetable forms for decoration and tracery. See *Saracenic Architecture.*

Indian-bay, *Laurus indica.* See *Laurel.*

Indian-berry, *Cocculus indicus.* See *Cocculus.*

Indian-cedar. See *Deodar.*

Indian Corn. See *Maize.*

Indian Fig, a name given to the *Opuntia Tuna* and *O. ficus-indica*, and other species of the Cactus family common in the tropical and sub-tropical countries of America, and now naturalized in Africa, Asia, and Southern Europe. They are generally from 10 to 12 feet high. Their fruit, which is egg-shaped and from 2 to 3 inches long, is cooling and wholesome, and yields a juice used for coloring confectionery. The wood of the stems becomes very hard with age.

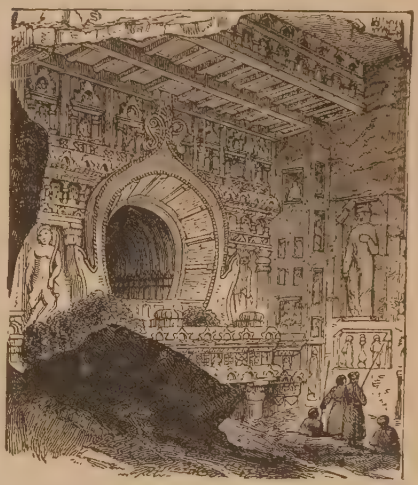
Indian Hemp, same as *Canada Hemp* (which see).

Indian Ink, a practically indelible writing ink of which there are two principal kinds—one prepared in Italy, Turkey, and Asia from certain cuttle-fishes, the other in China by fixing fine lamp-black with glue or size and a little camphor. The former when submitted to the action of an alkali becomes brown sepia.

Indian Mutiny. See *India (History).*

Indian Oak, a popular name for the teak-tree (which see).

Indian Ocean, that great body of water which has Asia on the north, the Sunda Isles and Aus-



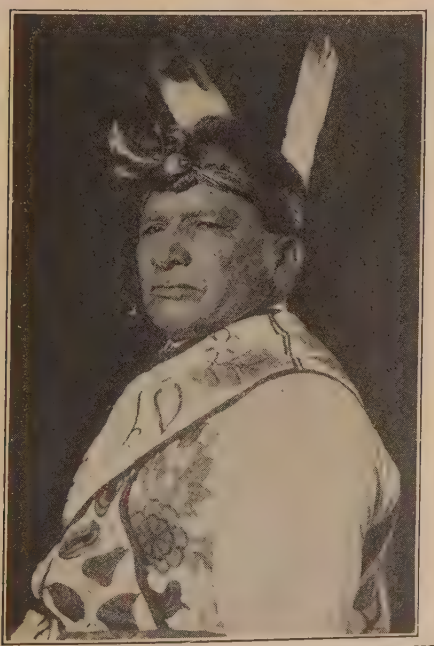
Exterior of the Chaitya Cave, Ajanta—Buddhist style.

tralia on the east, Africa on the west, and the Antarctic Ocean on the south. The Cape of Good Hope and the southern extremity of Tasmania may be considered its extreme southern limits on the

west and east. Its length from north to south somewhat exceeds 6500 miles, its breadth varies from 6000 to 4000 miles. It is traversed by the equatorial current flowing east to west, and its navigation by sailing vessels is more or less modified by the trade-winds and monsoons; greatest known depth, 3080 fathoms.

Indians (in'di-anz), AMERICAN, the collective name given to the tribes inhabiting the continent at the time of the discovery by Columbus, and to such of their descendants as still survive. The name of Indians was first given to these races from the notion that the newly discovered continent formed part of India. The inhabitants of India came later to be distinguished as East Indians and the others as American Indians, for which the contracted form, *Amerinds* was proposed and adopted by some writers. Other popular names for the American Indian are *Red men* or *Redskins*. Various theories as to their Asiatic origin are current, but so far as is known their culture is indigenous, being the reactions of the Indian to his environment. The Eskimo, the most northerly of the tribes, extends across the continent along the Polar Sea. South of these are the Athabascan group, represented by the Ten'a, Kaiyuhkho' 'tenne, and Tutchonekut'qin tribes on the Yukon River. The other Athabascans are chiefly found between Hudson's Bay and the Rocky Mountains, but include also the Dogribs, Caribou eaters, Nahanés Yellowknives and Slavé Indians of northwestern Canada and the Beaver Indians on Lake Athabasca; the large Navajo tribe of Arizona and New Mexico, and the Apaches, of Arizona, New Mexico and Oklahoma. Canada and the United States east of the Mississippi were formerly inhabited by the Algonquin and the Iroquois, generally at war with each other. The extreme west of the Algonquin region was occupied by the Blackfeet Indians; the Ojibwas, or Chippewas, held the shores of Lake Superior; south and west of Hudson's Bay were the Crees. The Leni-Lenape section of the Algonquin group comprised the five nations of the Delawares, including the Mohicans. The Iroquois included the Senecas, Cayugas, Onondagas, Oneidas, and Mohawks, who formed a league of five nations, afterwards joined by the Tuscaroras. The Hurons were of the Iroquois group. The Sioux group occupied the plains between the Rocky Mountains and the Mississippi, and included the Assiniboins, Winnepegs, Iowas, Dakotas, Omahas, Osages, Kansas, Crows, and Mandans. West of the Mississippi also were the Pawnees about the Nebraska or Platte River, and to the southeast were the Choctaws and Chickasaws. In the Rocky Mountain regions were the Shoshone or Snake Indians, including the Comanches and others. The Cherokee tribes, which inhabited South and North Carolina, the Creeks and Seminoles of Georgia and Florida, formed a detached group, and the Texas Indians were comprised in many small and diverse tribes. Below these, in New Mexico, a more advanced and distinct family is found called Moquis or Pueblo Indians, and westward the Apaches and various other tribes. Of the numerous families occupying Mexico the Nahuatls or Aztecs were the most powerful and civilized. The Otomis, speaking a peculiar language, were also a numerous people in Mexico. In Central America the predominating family was the Maya, including the Quichés, Kachiquels, etc. Portions of the Aztec tribes were also found in Central America. In South America the leading and more advanced families were those that made up the Peruvian Empire, among which the Inca race and the Aymaras were the chief. The Araucanians, to the south of these, in Chile, had a considerable resemblance to the Algonquins and Iroquois of North America. The remaining portions of South America, including the great alluvial tracts of the Atlantic slope, were principally occupied by the Guaranis; but along its northern coast were found the Caribs, who spread also over the Antilles and most of the West Indian Islands. In the extreme southern part of the continent live the tall Patagonians or Tehuelches, and squalid families in some respects resembling the more debased Australians.

By some ethnologists the American Indians are considered an aboriginal and single stock; by others a mixture of Mongolian, Polynesian, and Caucasian types; and by others as derived from the grafting of Old World races on a true American race. They are generally characterized as having long, black, and straight hair, scanty beard, heavy brows, receding forehead, dull and sleepy eyes, a salient and dilated nose, full and compressed lips, and the face broad across the cheeks, which are prominent, but less angular than in the Mongolian. The facial angle is about 75° (about 5° less than the European average); the hands and feet are small and well proportioned. The complexion varies from dark-brown to almost white; a somewhat reddish tint is common. The North American Indian is described as of haughty demeanor, taciturn and stoical; cunning, brave, and often ferocious in war; his temperament



FAMOUS INDIAN CHIEFS

Upper left, **MATO-WOPA-GEYA** or **Charging Bear,** Siouan-Yankton Tribe. Upper right, **AQUQAR-ENUTS** or **Cross Feathers,** Algonquin-Cheyenne (Southern) Tribe. Lower left, **WAWIEKUMIG** or **The Round Earth,** Algonquin-Chippewa Tribe. Lower right, **HOOSHTOGL** or **Tom Hill,** Shahaptian-Nez Perce Tribe.

poetic and imaginative, and his simple eloquence of great dignity and beauty. The Mexico-Peruvians worshiped the sun with human sacrifices and the grossest rites. Those of the United States and Canada believe in the two antagonistic principles of good and evil, and have a general belief in manitous, or spiritual beings, one of them being spoken of as the *Gitche Manitou*, or Great Spirit. They believe in the transmigration of the soul into other men and into animals, and in demons, witchcraft, and magic. They believe in life after death, where the spirit is surrounded with the pleasures of the 'happy hunting grounds,' though they have no idea that the acts of their present life can have any connection with their future happiness. They adopt a *totem* or symbol of the name of the progenitor of the family; this is generally some animal (the turtle, bear, and wolf being favorites), which is the mark of families even when expanded into tribes. No marriage rite is necessary beyond the consent of the parties and their parents; but the wife may be dismissed for trifling causes, and polygamy is allowed. In ancient times the body was covered with furs and skins according to the seasons, but now the white man's clothes and blanket have generally superseded the native dress; though the moccasin of deer or moose hide, and in the wilder tribes the ornamental leggings and headdresses are largely retained. Their dwellings are made of bark, skins, and mattings of their own making, stretched on poles fixed in the ground. Their arms consist of the bow and arrow, the spear, tomahawk, and club, to which have been added the gun and knife of the whites. Canoes are made of logs hollowed out, or of birch bark stretched over a light frame, skilfully fastened with deers' sinews, and rendered water-tight by pitch. The Indians of the United States, however, are now largely gathered into reservations and their former dress, arms and habits are being changed for those of the whites. Civilization is invading them and driving out their older characteristics. This is especially the case with the large numbers now dwelling in the former Indian territory, now Oklahoma. The antiquities found in Mexico and Peru, and the ruins of elaborate buildings in Central America, prove that the semi-civilized races there existing had made considerable progress in sculpture and architecture. The number of Indians in the British possessions is about 130,000, in the United States (1910), 265,683, in Central America 1,500,000, and in Mexico 4,000,000, in all North America somewhere about 6,000,000. In South America their number is probably about 10,000,000, many of them being more or less civilized and professing Christianity.

Indian Shot (*Canna indica*), an ornamental plant of the Arrow-root family, found in most tropical countries. The seeds are round, hard, and black, hence the name of Indian shot applied to the plant.

Indian Summer, the name given to a period of mild summer weather which generally occurs towards the end of autumn in North America, usually in November.

Indian Territory, See *Oklahoma*.

Indian Yellow, or PUREE, a pigment of a bright yellow color, but not permanent; used in water-color painting. It is composed of the phosphate of urea and lime, and is imported from India.

India Paper, a name originally given to a very light, absorbent buff paper made by hand in China. The use of the word 'India' was probably due to the tendency to give that name to anything originating in the East. Its first use was in printing very fine engravings, which were therefore commonly called 'India proofs.' The original India paper was introduced into Europe in 1841, where tests showing its great strength and durability created wide interest among paper manufacturers, who thereupon undertook to duplicate it. The term is now used to describe an extremely light, thin paper, very tough and opaque, made principally in England, Germany, Italy, France, Holland and Belgium, and used especially in printing Bibles, but also frequently in other books where it is desirable to reduce their bulk and weight, without affecting their durability, or necessitating smaller type.

India paper is essentially a rag paper, no mechanical wood pulp being used. The opaque character is due to the large percentage of mineral matter remaining in the fiber. Even more important than the materials used is the great skill and care exercised throughout the processes of manufacture to retain the mineral matter

India Rubber, a peculiar elastic substance composed of carbon and hydrogen, found in suspension in the milky juice of many different families of plants. (See *Caoutchouc.*) The crude rubber is usually prepared where the juice is collected, by drying the juice over a fire in the sun on moulds of clay, paddles, or lasts; by evaporating the juice in the sun and removing the

successive pellicles formed on the surface; or by coagulating the juice, as in Nicaragua, by an application of the juice of the bejuca vine, and kneading and rolling the coagulated mass. Most of the rubber of commerce is derived from Brazil and the Andes states of South America, also from Central America, Mexico, etc.; smaller quantities from Java, Penang, Singapore, Assam, and South Africa. The purest comes from Pará, Brazil, in large bottles and thick plates. Prior to the introduction of rubber into Europe, in the early part of the eighteenth century, it had already been turned to various domestic and industrial uses, such as the making of bottles, syringes, boots, and waterproofing, by the natives and residents along the banks of the Amazon. In Europe the first important practical applications of it are associated with the names of Mackintosh, the patentee in 1823 of a waterproofing process by the solution of the gum in oil of turpentine and alcohol and in coal-tar naphtha, and Handcock, the inventor of the 'masticator,' a machine for the condensation of crude lumps or shreds of caoutchouc, as imported, into compact homogeneous blocks for subsequent division into cakes, sheets, rollers, etc. Its great modern utility, however, is due to the American inventor, Charles Goodyear, the inventor of the vulcanizing process, in which rubber is hardened by the addition of sulphur, patented in 1844. Since then its uses have multiplied so rapidly that it is employed in every department of industry. Thus apart from its use in blocks and sheets, etc., in tapes or threads for weaving into elastic tissues, and as varnish for waterproofing, it is employed, in combination with other resinous materials in a solvent such as naphtha, as a cement or marine glue. When combined with a small quantity of sulphur, etc., it is used for the manufacture of overshoes, boots, gloves, life-preservers, gas-bags, steam and water packing, belting, fire-hose, tubing, springs, tires, artificial sponges, etc. With a larger proportion of sulphur, and cured or vulcanized by exposure to a high temperature, it is used for the manufacture of combs, pen and pencil holders, rulers, inkstands, buttons, canes, syringes, jewelry, and, when colored with vermilion, for mountings for artificial teeth, etc. In combination with asphalts, oils, and sulphur, etc., and vulcanized (*kerite*) it is used for covering telegraph wires. A new field for its use has lately developed in the large automobile tires, the rapid progress of the automobile industry having so greatly increased the demand as to bear heavily on the sources of supply and considerably increase the market value of rubber. The insufficient supply has led to active search for new sources and the development of existing sources, especially that of Mexico, which has become one of the important rubber producers. Lazaculapa district, Chiapas, is the largest in the world, with 7,000,000 trees and an output of 100,000 lbs. The export from Brazil in 1910 was 38,953 tons, of which 17,071 came to the United States. The Palo Amarillo tree and the Guayule shrub of Mexico yield rubber in addition to the regular rubber tree, and rubber-yielding plants have been found elsewhere, as in Mozambique and Africa south of the Zambezi, where is a thick vine called the laudolphia, which yields this product.

Indicative (in-dik'a-tiv), that mood of the verb in which something is said positively; hence it has also been called the positive mood, as distinguished from the subjunctive and potential.

Indicator (in-di-kā'tur), (1) an instrument for ascertaining and recording the pressure of steam in the cylinder of a steam-engine, in contradistinction to the steam-gauge, which shows the pressure of the steam in the boiler. (2) An apparatus or appliance in a telegraph for giving signals or on which messages are recorded, as the dial and index hand of the alphabetic telegraph. (3) A genus of African birds, the honey-guides or honey-guide cuckoos. See *Honey-guide.*

Indic Languages, the class of Indo-European (Aryan) languages comprising the dialects at present spoken in India, as Hindi, Hindustani, Mahratti, Bengali, and the dead languages Prakrit, Pali, and Sanskrit.

Indiction (in-dik'shun), in chronology, a period or cycle of fifteen years, supposed to relate to some judicial acts, probably the publication of tariffs of the taxes which took place at stated intervals under the Greek emperors. Three sorts of indiction are mentioned:—(1) the Cæsarean, which fell on the 8th of the calends of October, or 24th of September; (2) the indiction of Constantinople (beginning A.D. 312), on the 1st of September; and (3) the pontifical or Roman, which begins on the calends of January. We find ancient charters in England dated by indictions.

Indictment (indīt'ment), in law, a written accusation of one or more persons for a crime or misdemeanor, preferred to and presented

upon oath by a grand jury to a court. Indictments must have a precise and sufficient certainty.

Indigestion (in-di-jest'yun). See *Dyspepsia.*

Indigirka (en-dye-ger'ká), a river of Eastern Siberia, flowing northwards into the Arctic Ocean; length 750 miles.

Indigo (in'di-gō), a blue vegetable dye, extensively employed in dyeing and calico-printing; an important commercial product in the East and West Indies, Mexico, Brazil, Egypt, etc. It is chiefly obtained from various leguminous plants of the genus *Indigofĕra*, herbaceous or shrubby plants, with pinnate leaves, and small, blue, purple, or white

Indigo-plant (*Indigofera tinctoria*).

pea-shaped flowers disposed in axillary racemes. They are very numerous in the equatorial regions of the globe. The species most commonly cultivated are the *I. Anil*, a native of Tropical America, but now cultivated also in the East Indies; the *I. tinctoria*, also cultivated in both Indies; and the *I. cærulea*. The *I. tinctoria* is the species most abundantly cultivated. The greater part of the indigo used at the present day comes from India, especially from the provinces of Bengal, Oude, and Madras. The ground is ploughed towards the end of the year, and the seed sowed in the early spring of the following year. The first cutting of the plants takes place about midsummer, and the second about two months later, the process of extracting the dye varying as the leaves are fresh or dried. Indigo occurs in the market in pieces which are sometimes cubical, sometimes of an irregular form; these pieces are easily broken, the fracture being dull and earthy. The color varies from light-blue to blackish-blue; when rubbed with the nail a copper-colored streak is formed on the surface of the mass. Indigo is insoluble in water, but when exposed to the action of certain deoxidizing agents it becomes soluble in alkaline solutions, losing its blue color and forming a green solution from which, when precipitated by acids, it becomes white, but it instantly becomes blue on exposure to the air. Commercial indigo contains about 50 to 60 per cent. of pure indigo blue, the remainder consisting of substances called indigo gluten, indigo yellow, indigo red, etc. Artificial indigo is now produced by chemical processes, having been discovered in 1878. This has come into use sufficiently to diminish the demand for the natural product, and is said to be superior to the latter in color and wearing powers.

Indigo-bird, a North American bird (*Cyanospiza cyanea*) of the finch family. It is of a deep-blue color, and is a good songster.

Indigo-copper, the native protosulphide of copper, of an indigo-blue color.

Indigofera (in-di-gof'e-ra), a large genus of plants, nat. order Leguminosæ, including about 220 species, indigenous in the warmer parts of Asia, Africa and America. See *Indigo.*

Indigometer (in-di-gom'e-tẽr), an instrument for ascertaining the depth of color of indigo.

Indium (in'di-um), a metal discovered by Reich and Richter in 1863 by means of spectroscopic analysis in the zinc-blende of Freiburg. It has been isolated in small quantities, and is of a silver-white color, soft, and marks paper like lead; specific gravity, 7.421 at 16°.8. The metal is related to cadmium and zinc, and its spectrum exhibits two characteristic lines, one violet and another blue.

Indo-China, the name now given to the southeastern peninsula of Asia, comprising Burmah, Siam, Cambodia, Cochin-China, Tonquin, Anam, etc. It was formerly known as Farther India.

Indo-European Languages, also called ARYAN or INDO-GERMANIC, the most important of the great families into which human speech has been divided, spoken by various peoples in Asia and Europe. The chief branches of this family are the Teutonic or Germanic, including English, German, Dutch, Danish, Swedish, Icelandic, and the extinct Gothic; the Slavonic (Polish, Russian, Bohemian); the Lithuanian; the Celtic (Welsh, Irish, Gaelic, Breton); the Latin or Italic, and the Romance tongues descended from it (French, Italian, Spanish, Portuguese); the Greek, the Armenian, the Persian, and the Sanskrit. All these tongues are regarded as being descended from a common ancestral tongue or parent speech, spoken at some remote period in the original home of the Aryans. This home has been variously located in Central Asia, Scandi-

navia, Caucasia, etc., by different writers. See *Philology*.

Indore, or INDOR (in-dōr'), a protected native state of Hindustan, connected with Central India, and consisting of several detached portions, the largest being bisected by the Narbada; total area, 8400 sq. miles. It forms the remnant of the sovereignty of the Mahratta dynasty of Holkar, and Holkar as the family name is associated with the title Maharajah, which belongs to the ruler of the state. It is traversed by the Vindhya Mountains, and much of the country is well wooded. Indore is generally fertile, the cultivated crops including wheat, rice, millet, cotton, sugar-cane, oil-seeds, tobacco, and opium, which is one of the principal products. Among the inhabitants are numerous Bheels. The ruling class are Mahrattas. The Holkar dynasty was founded by Mulhar Rao about the middle of the eighteenth century. Their dominions were at one period much more extended than at present. Pop. about 850,690.—INDORE, the capital, is of modern origin, and in recent times has rapidly increased. The Maharajah's palace is the most conspicuous edifice. The British residency is one of the handsomest in Hindustan. Pop. (1911) 44,947.

Indorsement (in-dors'ment), or ENDORSEMENT. See *Bill*.

Indra (in'dra), a Hindu deity, originally representing the sky or heavens, and worshiped in the Vedic period as the supreme god, though he

Indra.—Coleman's Hindu Mythology.

afterwards assumed a subordinate place in the Pantheon. He is commonly represented with four arms and hands riding on an elephant. When painted he is covered with eyes. He is at once beneficent as giving rain and shade, and awful and powerful in storm as wielding the thunderbolt. In one aspect he is lord of *Swarga*, the beautiful paradise where the inferior gods and pious men dwell in full and uninterrupted sensuous felicity.

Indre (ȧndr), a department of Central France; area, 2666 square miles. It belongs to the basin of the Loire, which receives its waters by the Indre, a river of 140 miles length, the Creuse, and the Cher. The department is generally flat, and nearly two-thirds of the surface is arable. Large crops of wheat and barley are produced; other important crops are hemp and flax. A considerable quantity of land is occupied by vineyards. The minerals include iron, lithographic stones, and several varieties of marble. The principal manufactures are fine woolen cloth, and iron and steel goods, linen, hosiery, etc.. Châteauroux is the capital. Pop. 290,216.

Indre-et-Loire (ȧndr-ē-lwär), a department of Central France; area, 2377 square miles. It belongs to the basin of the Loire, and is traversed both by it and its tributary the Indre, as also by the still more important tributaries the Vienne and the Creuse, besides the Cher. They are all navigable within the department, and furnish it with almost unlimited means of water communication. The surface is finely diversified, and more than one-half is arable. Hemp and flax are extensively cultivated, and fruit is very abundant. Iron is worked to some extent; and there are valuable millstone quarries. Clay, both for ordinary purposes and the finer kinds of pottery, is abundant. The manufactures are not of much importance. Tours is the capital. Pop. 337,916.

Induced Current (in-dūst'), the current of electricity which is produced or excited in a conductor when the magnetic field in which it is placed is altered in any way; that is, 1st, when the strength of the current in a neighboring conductor is altered; or 2d, when a neighboring conductor in which a current flows is altered in position; or 3d, when a neighboring magnet is moved; or 4th, when the magnetization of a neighboring magnet is altered. Thus, if there is a closed circuit, say a coil of wire with its ends joined, through which no current is passing, the motion of a magnet in its neighborhood will induce a current in it, the direction of this current being always such as to oppose the motion.

Induction (in-duk'shun), in logic, is that process of reasoning by which we rise from the particular to the general, and is the counter-process to deduction. In induction particulars

are not only raised into generals, but these into still higher generalities. In following this method we proceed from the known to the unknown, and obtain a conclusion much wider than the premises. Thus a person who has had any experience easily arrives by induction at the conclusion that fire burns wood, and when any piece of wood whatever is presented to him he will have no hesitation in saying that fire will burn it. As it is impossible that all particulars can be observed, there is always a certain risk of error, and the inductive method must be worked with extreme caution; but science properly so called would be impossible if we did not presuppose a faculty of arriving from experience at the knowledge of truths not contained in that experience. Hence the ground of induction is the established fact that nature is uniform.

Induction, in English ecclesiatical law, the investing of a clerk presented to a benefice with the temporalities thereof. The person inducting takes the clerk by the hand, and lays it on the ring, key, or latch of the church-door or wall of the church; or he delivers a clod, turf, or twig of the glebe, and thus gives corporal possession of the church. The doors are then opened, the clerk put into the church, and the bell tolled to make the induction known. The incumbent must assent to the Thirty-nine Articles and the Book of Common Prayer, and take the oath of allegiance. In Scotland the minister is inducted by the presbytery.

Induction, ELECTROMAGNETIC, the action by which a current of electricity is produced in a conductor when the magnetic field in which it is placed is altered in any way. See *Induced Current.*

Induction, ELECTROSTATIC, the action by which the distribution of a charge of electricity on a conductor is altered by the approach of an electrified body. When a body charged with one kind of electricity is approached towards an insulated conductor which originally had no charge, a charge similar to that of the influencing body is produced on the remote side, and an equal charge of the opposite kind on the near side of the insulated conductor. It is to the mutual induction between the two coatings, one charged positively, that the Leyden-jar is indebted for its large electrical capacity.

Induction, MAGNETIC, the action by which iron and other substances become magnetic when in a magnetic field, that is, when in the neighborhood of magnets or currents of electricity. See *Electro-magnetism, Magnetism.*

Induction-coil, an instrument invented by Ruhmkorff, in which rapid breaking and making of the current of electricity in a primary short coil of wire gives rise to a succession of induced currents (see *Induced Current*) of very great electro-

Induction-coil.

motive force in a long secondary coil. Such a coil often consists of a copper wire many miles in length, and a succession of powerful sparks passes between its terminals when the primary current is rapidly made and broken.

Indulgence (in-dul'jens), in the Roman Catholic system is the remission granted by the church to a repentant sinner of the temporal punishment due to his sin, whether this punishment be the pains of purgatory, or penance which the church has the right to impose according to the gravity of the sin. It must be understood that the indulgence is never to be considered as constituting a remission of the sin itself. The principle of indulgences rests on that of good works. Many saints and pious men have done more good works and suffered more than was required for the remission of their sins; these are known as *works of supererogation*, and the sum of this surplus constitutes a treasure for the church, which is under the control of the pope, who is privileged to make use of it as he finds advisable in exchange for pious works. Indulgences are of two kinds: *plenary* when considered an equivalent substitute for all penance; and *partial*, when only a portion of penitential works is relaxed. *Local* indulgences are attached to particular places, *real* indulgences to various good works. The historic origin of indulgences is traced to the public penances and the canonical punishments which the early Christian church imposed on offenders, especially on those who were guilty of any grievous crime, such as apostasy, murder, and adultery. When ecclesiastical discipline became milder it was allowed to commute these punishments into fines for the benefit of the church. The first recorded instance of the use of the name indulgence was by Alexander II in the

eleventh century, but the institution itself was in full development during the Crusades. At first the only source of indulgences was in Rome, and they could be obtained only by going there. The supposititious abuse of granting indulgences inflamed the zeal of Luther, and the Protestant theologians have always found indulgences one of the most assailable points of the Roman Catholic system.

Indus (in'dus), the chief river of the northwest of Hindustan. It has a length of about 1800 miles, drains an area of about 370,000 square miles, and rises in Tibet on the north of the Himálaya Mountains. At first it flows in a northwesterly direction, but after bursting through the Himálayas flows southwest till it enters the Indian Ocean. At Attock it is joined by the Kabul from Afghanistan, and here, 950 feet above the sea, it is nearly 800 feet wide, and from 30 to 60 feet deep according to the season. Near Mittankot it receives on the east the Panjnad, or united stream of the 'Five Rivers' of the Punjab. In Sind it gives off several extensive arms or canals, which are of great value for irrigation; and below Haidarabad it divides into a number of mouths. Its delta extends about 130 miles along the coast. Vessels drawing more than 7 feet cannot generally enter any of its mouths; but steamers of light draught ascend from Haidarabad to Multan.

Industrial and Provident Societies, societies that carry on some trade for the mutual benefit of the members. In Great Britain various acts have been passed for the regulation of such societies, the most important being in 1876, amending and consolidating all previous acts. The Societies which may be registered under this act are societies for carrying on any labor, trade, or handicraft, whether wholesale or retail, of which societies no member other than a society registered under this act shall have or claim an interest in the funds over £200. No society can be registered which has a membership of less than seven persons; and every society must have a registered office; must publish its name outside the office and elsewhere; must submit its accounts to an annual public audit; must send annual returns to the registrar, etc. A register of its members' names must be properly kept. The registrar, on application of one-fifth of the members, may, with the consent of the treasurer, appoint one or more inspectors to examine into the affairs of the society and report thereon. Societies of this kind have made no progress in the U. S.

Industrial Education in a broad sense includes all vocational education relating to the industries. In common usage, however, the term is not applied to the professional training of the engineering schools (see *Technical Schools*), or to manual training of the elementary schools (see *Manual Training*), but to the field of specialized training lying between the two. Both trade and technical education are the development of the nineteenth century, and owe their appearance, on the one hand, to the growth of the factory system with its division of labor and the breakdown of the apprenticeship system, and, on the other, to the increased application of science to the industries. The first important step in the direction of such education in the United States was the establishment of a number of evening schools under private auspices. The first trade school established in the United States was the New York Trade School, founded in 1881. Another movement led to the establishment of preparatory trade schools for youths of legal working age, who now leave the elementary schools in large numbers. These schools do not aim at specialized trade training, but afford instruction that will give a boy or girl a definite advantage in entering upon the work of mill or factory, or in entering upon apprenticeship at a skilled trade. A part-time or co-operative plan, is also employed in some cities.

I. W. W. (Industrial Workers of the World). See *Labor Organizations.*

Inertia (in-ėr'shi-â), or Vis Inertiæ (Lat. the 'power of inactivity'), the passiveness of matter, or its indifference to rest or motion. Newton's first law treats of this property, in virtue of which a body at rest will remain at rest, and a body in motion will continue to move in a straight line and with a uniform velocity unless some force acts upon it.

Infallibility (in-fal-i-bil'i-ti), exemption from the possibility of error in regard to matters of both faith and morals—a claim made by the Roman Catholic Church both on its own behalf and on that of the pope. The infallibility of the church is of two kinds, *active* and *passive;* the former signifying the function of the church of authoritatively settling doctrinal disputes; and the latter that property in virtue of which she can never embrace erroneous doctrine. The infallibility of the pope was settled in the Vatican Council, 1870. The dogma was

then formulated in the following terms: —'We teach and define that it is a dogma divinely revealed; that the Roman pontiff, when he speaks *ex cathedra*—that is when in discharge of the office of pastor and doctor of all Christians, by virtue of his supreme apostolic authority, he defines a doctrine regarding faith or morals to be held by the universal church, by the divine assistance promised to him in blessed Peter—is possessed of that infallibility with which the Divine Redeemer willed that His church should be endowed for defining doctrines regarding faith or morals, and that, therefore, such definitions of the Roman pontiff are irreformable of themselves, and not from the consent of the church.' A considerable body refuse to acknowledge the infallibility of the popes. See *Old Catholics.*

Infant (in'fant), a term in the English and American law for persons who have not attained their *majority*, that is, the age of twenty-one years. In general, contracts made by infants are not binding, except for necessaries suited to their state. Being an infant is no bar to criminal proceedings; but young persons are not punished for offences if they have not knowledge and discretion to distinguish them to be such. Infants require the consent of parents or guardians to marry. The jurisdiction in respect to infants is generally vested in either probate or orphans' courts.

Infante (in-fân'te), or INFANT (from Lat. *infans, child*), the title given in Spain and Portugal to the princes of the royal house. The princesses are called *infanta.*

Infanticide (infan'ti-sīd), the murder of an infant, a crime that is especially common in the case of illegitimate children, the main cause being shame; but infanticide is sometimes the result of puerperal insanity. In trial for infanticide it must be proved that the child was born fully alive. Infanticide was prevalent in Greece and Rome. In modern times many barbarous nations are guilty of wholesale child-murder. Among the South Sea Islanders and aboriginal Australians the destruction of infant life is systematized. The Hindus destroy female children without compunction, and abortion is common among the Mohammedans. In China, also, infanticide is common.

Infantile Paralysis, an infectious disease, a form of spinal paralysis occurring frequently in young children. It comes on suddenly, and the paralysis itself may not be observed until several days have elapsed. The early symptoms are fever, convulsions, sometimes vomiting, and numbness or tingling in the limbs affected. The paralysis affects usually one leg, more often two, occasionally the arms and the face. The whole of the limb is not necessarily paralyzed; often only a certain group of muscles is affected. These muscles rapidly waste and become flaccid. In less severe cases not the whole limb but only a group of muscles is affected, and there is always some hope of return of power. Usually, however, a limb paralyzed in infancy does not grow. Few cases are fatal.

The alarming increase of the disease in the United States within recent years has led to wide study and much speculation. Investigations have shown that the disease is transmissible and that it is due to a specific organism. During the acute stages of the disease, therefore, patients should be isolated and all discharges from the nose and mouth should be disinfected. Treatment at the outset should be directed to the relief of the pain, and the promotion of elimination by means of laxatives, nourishing food, hot baths, etc. About a month afterward local treatment of the atrophied muscles should be commenced, and effort made to prevent deformities. For the connection of the stable fly with infantile paralysis see *Stable Fly.*

Infantry (in'fan-tri), foot-soldiers collectively. Except among semibarbarous nations, and during the prevalence of the institutions of chivalry, infantry has always been considered the most important military arm, and this has been peculiarly the case since the formation of standing armies. Infantry may be divided into various classes, most commonly into light infantry and infantry of the line. Under equal circumstances well-trained infantry is almost universally successful against any other kind of troops.

Infant Schools, institutions established in the latter part of the eighteenth century for the education of very young children. Waldbach, in Alsace, and New Lanark, in Scotland, are both claimed as the cradle of the infant school.

Infection (in-fek'shun) a term sometimes used to signify the communication of disease through the atmosphere, as contrasted with *contagion* (*con*, and *tango*, to touch), communication of disease through the medium of touch. In many cases infection and contagion are used as synonymous. Some diseases may spread in both manners.

Infectious Diseases. See *Contagion.*

Infernal Machines (in-fêr'nal), contrivances made to resemble some harmless object, yet filled with a dangerous explosive. They are arranged to be set off by clockwork, or on opening a box containing the explosive. The bombs of dynamite or other explosive substance now so often thrown or set off by a fuse for the purpose of causing death or destruction of property must be classed in the same category.

Infinite (in'fin-it), a term in metaphysics, which has been the source of much controversy. Some maintain that there corresponds to infinity a distinct notion; while others affirm that the word is a name for a mere negative, that we can never really form any distinct idea of the infinite.

Infinitesimal (in-fin-i-tes'i-mal), in mathematics, an infinitely small quantity, or one which is so small as to be incomparable with any finite quantity whatever, or which is less than any assignable quantity. The *infinitesimal calculus* is a department of the higher mathematics which embraces both the *differential* and the *integral calculus.*

Infinitive (in-fin'i-tiv), the indefinite mood of a verb, or that in which the verb is represented without a subject; the mere name-form of the verb. As the verb expresses an action, or a state, it generally belongs to a subject whose action or state is expressed; but if we wish to express the mere idea of this action or state we use the infinitive, which, therefore, in many languages is employed without further change as a substantive—for instance, in Greek and German—only preceded by the neuter article. The infinitive may be regarded as the point of transition from a verb to a substantive, and is often used as the subject of a proposition.

Infirmary (in-firm'a-ri). See *Hospital.*

Inflammation (in-fla-mā'shun), a vague term for a morbid process, of which the most obvious phenomena are pain, swelling of the affected part, perceptible increase of heat to the patient, and redness beyond the natural degree, often followed by febrile symptoms. Inflammations may arise from external injuries, or may be brought on by morbid or poisonous matters in the system, sudden changes of temperature, etc. The three commonly described terminations of inflammation are *resolution, suppuration* and *mortification* or *sloughing. Resolution* is that recovery from the disorder which is effected without the intervention of any disorganizing process, and when the vessels return to their normal condition on the exciting cause of the disorder being withdrawn, and this is the most favorable mode of termination. If inflammation cannot be resolved it may go on to *suppuration,* when the skin is either divided by the knife or breaks of itself, and there is an escape of a yellow, cream-like fluid, after which the symptoms may abate. The tendency to suppuration is marked by the pain becoming full and throbbing, while the pulse becomes more full without being less frequent. *Mortification* is accompanied by the sudden cessation of pain, and there is the actual death of the part affected. When the circumstances are favorable this dead part sloughs off by a vital process known as *ulceration,* and the cavity gradually fills up and heals. In many cases inflammation may rather be considered as a salutary process than as a disease, for it frequently prevents evils which would occasion either serious or fatal consequences. The most important remedy in cases of severe inflammation is hot fomentations, blisters, bloodletting, the warm bath, combined with low diet and perfect quietude. In the beginning cold is excellent. As to inflammation of the intestines, see *Enteritis;* of the eye, see *Iritis;* of the bowels, see *Peritonitis;* of the brain, see *Meningitis;* of the lungs, see *Pneumonia.*

Inflection (in-flek'shun; Latin, *inflexio,* a bending), in grammar, the changes in form which words undergo in consequence of standing in certain relations to other words in a sentence. These changes occur for the most part at the end of words, and the inflectional elements were all probably at first separate vocables. To inflection belong those changes which comprise cases, numbers, persons, tenses, etc. In some languages we have positive proof of inflections being formed of words originally distinct. Thus Fr. *aimerai,* I shall love, the future of *aimer,* to love, is, literally and historically, I have to love, and is compounded of *aimer,* to love, and *ai,* I have, the first person present indicative of *avoir.* The same is the case in Italian and Spanish. The loss of inflections is a common feature of the Romance tongues as compared with the Latin, on which they are based, and is also a feature of English as compared with Anglo-Saxon. The result in both cases is much less freedom in the arrangement of words, but this is probably counterbalanced by greater perspicuity.

Inflorescence (in-flor-es'ens), in botany, the mode of flowering of any species of plant, that is, the manner in which its blossoms are grouped together, and in some cases in which they are successively open. The principal

Varieties of Inflorescence.

1, Spike. 2, Amentum or Catkin. 3, Raceme. 4, Panicle. 5, Whorl. 6, Umbel—*a*, simple, *b*, compound. 7, Cyme. 8, Corymb. 9, Thyrsus. 10, Head or Capitulum. 11, Fasciculus or Fascicle. 12, Spadix. 13, Anthodium.

forms of inflorescence are the *amentum*, *corymb*, *cyme*, *raceme*, *panicle*, *thyrsus*, *spike whorl* (see those terms); *thyrsus*, *gal* and *centripetal* are also terms applied to two kinds of inflorescence.

Influenza (in-flö-en'za; Italian, influence), a term used rather laxly to denote an epidemic catarrh of a rather severe character, the symptoms of which are those of what is usually called a cold, with others such as lassitude and general depression, loss of sleep, feverishness, nausea, loss of appetite, sometimes vomiting, often an inflammatory state of the throat and pharynx, bronchitis, or other complications. It is not usually fatal, the patient generally recovering in a week or ten days, but it sometimes leaves behind chronic bronchitis or consumption. Another form of influenza, known under the name of la grippe, has at intervals spread extensively. This is an acute infectious disease probably caused by the presence of the bacillus of influenza, though other bacteria have been urged as the exciting cause. An epidemic of it began in the United States about 1890, and since that date it has never disappeared, occasionally breaking out severely. The various epidemics have differed somewhat in their severity and also in their sequelæ, the latest visitation being, perhaps, the most severe. This epidemic, occurring in 1918, was particularly severe, and presented unusual symptoms; and it was, for no valid reason, called Spanish influenza. Many of the cases in this epidemic were followed by pneumonia. It is very apt to leave the patient with some organic weakness, the weaker parts of the system seeming the most susceptible to its attacks. Premature exertion after influenza may lead to heart disease, indigestion or damage of the nervous system. The patient should go to bed at once, and seek the advice of a physician. Time spent in 'fighting against' the disease is not only time lost, but means loss of the patient's strength, with possible complications and, perhaps, a fatal result.

Information (in-for-mā'shun), in law, a complaint or accusation exhibited against a person for some criminal offense. It differs in no respect from an indictment, except that it is filed at the mere discretion of the proper law officer of the government, *ex officio*, without the intervention of a grand jury. The process has not been put in motion by Congress for misdemeanor, but is common in civil prosecutions, for penalties and forfeitures. The information is usually made upon knowledge given by some other person than the officer, called the *relator*.

Informer (in-for'mėr), in law, a person who informs or prefers an accusation against another, whom he suspects of the violation of some penal statute.

Infusion (in-fū'zhun), a solution of some vegetable substance in hot or cold water, such as are often used for medicinal purposes. The water employed may be at boiling heat, but if the substance is itself boiled the result is a *decoction*. In preparing certain infusions cold water is preferable, as bringing out the constituent desired.

Infusoria (in-fū-sō'ri-a), a class of minute, mostly microscopic, animals, so named from being frequently developed in organic infusions, provisionally regarded as the highest class of the Protozoa. They are provided with a mouth, are destitute of pseudopodia, but are furnished with vibratile cilia. Most are free-swimming, but some form colonies by budding, and are fixed to a solid object in their adult condition. The body consists of outer transparent cuticle, a layer of firm sarcode called the cortical

layer, and a central mass of semiliquid sarcode which acts as a stomach. A nucleus, having attached to its outside a spherical particle called the nucleolus, is embedded in the cortical layer. Contrac-

MAGNIFIED DROP OF WATER SHOWING INFUSORIA, ETC.

1, Volvox globator (a plant, a low form of Alga). 2, Stentor polymorphus. 3, Urceolaris scyphina. 4, Stylonychia mytilus. 5, Zoöspermos Ferussaci. 6, Trichoda carinum. 7, Monas termo. 8, Pandorina morum. 9, Bursaria truncatella. 10, Vaginicola crystallina. 11, Cercaria gibba. 12, Zoöspermos decumanus. 13, Amphileptus fasciola. 14, Vorticella convallaria. 15, Euptotes truncatus. 16, Trachelocerca olor.

tions of the body are effected by sarcode fibers. The cilia, with which most are furnished, are not only organs of locomotion, but form currents by which food is carried into the mouth. Reproduction takes place variously. They are divided into three orders, Ciliata, Suctoria, and Flagellata, in accordance with the character of their cilia or contractile filaments. Many of the organisms formerly included among Infusoria are now regarded as vegetable.

Ingalls (ing'gâlz), JOHN JAMES, statesman, was born in Middleton, Massachusetts, in 1833. He removed to Atchison, Kansas, in 1858, and was elected to the State Senate in 1862. From 1873 to 1890 he was a United States Senator, and attained a wide reputation as an orator. He was president pro tem. of the Senate during his last three years of service. He died in 1900.

Ingelow (in'je-lō), JEAN, an English poetess, born in 1830; died in 1897. In 1863 she published a volume of poems, which ran through fourteen editions in five years, and her popularity afterward increased both through her prose writings and her poetry. In prose she wrote novels and tales for children, including *Mopsa the Fairy*, *Studies for Stories*, *Off the Skelligs*, *Sarah de Berenger*, *Don John*, etc. Her *High Tide on the Coast of Lincolnshire, 1571*, was her most famous poem.

Ingemann (ing'e-măn), BERNHARD SEVERIN, a Danish poet and novelist, born in 1789; died in 1862. After attaining distinction by his lyric narrative and dramatic poetry he traveled in Germany, France, and Italy in 1818-19, and on his return wrote historical romances (taking Scott as his model) illustrative of the habits of his countrymen during the middle ages; some of these have been translated into English.

Ingersoll (in'ger-sol), ERNEST, naturalist, born at Monroe, Michigan, in 1852. He was employed on the Hayden Survey and the Fish Commission, and wrote a number of works, including *Natural History of Nests and Birds; Friends Worth Knowing; The Ice Queen; Wild Neighbors*, etc.

Ingersoll, ROBERT GREEN, orator, born at Dresden, New York, in 1833. He was admitted to the bar in 1854, soon gained distinction as an orator, and engaged in the Civil war as colonel of a cavalry regiment. He became attorney-general of Illinois in 1866, and in 1876, at the Republican National Convention, made a striking oration in favor of the nomination of James G. Blaine as a candidate for the Presidency. For years he lectured against the Christian doctrines, becoming very popular as a lecturer on this and other subjects, but injuring himself in public estimation. He died in 1899.

Ingersoll, a town of Oxford Co., Ontario, Canada, on Thames River, 20 miles E. of London, on the Grand Trunk, Canadian Pacific and other railways. It has manufactures of tools, furniture, hay forks, pianos, nuts, machine screws; also woolen and grist mills, fertilizer plant, condensed milk plant, etc. Pop. 5500.

Ingoldsby, THOMAS. See *Barharm, R. H.*

Ingolstadt (ing'ol-stât), a fortified town of Bavaria, on the Danube, 35 miles S. W. of Ratisbon. It has an old and a new castle, a fine old Gothic church, a Jesuit college, an arsenal, etc.; manufactures of ordnance and gunpowder, breweries, etc. Ingolstadt had a university of some celebrity, founded in 1472, but in 1800 it was removed to Munich. Pop. 22,207.

Ingot (ing'got), a small bar of metal made of a certain form and size by casting it in moulds. The term is chiefly applied to the small masses or bars of gold and silver intended either for coining or exportation to foreign countries.

Ingres (an-gr), JEAN DOMINIQUE AUGUSTE, a French painter, born in 1781. He studied under David. About 1804 he went to Rome, where he resided for fifteen years, and after a further residence of four years in Florence he succeeded Denon in the School of Fine Arts in Paris, his fame being by this time fully established. In 1833 he succeeded Horace Vernet as director of the French Academy at Rome. In 1834 he was nominated Chevalier, and in 1845 commander of the Legion of Honor. In 1855 he received the grand medal of honor at the International Exhibition, and in 1862 he was made a senator and member of the council of public instruction. He died at Paris in 1867. Among the best known of his numerous pictures are *Bonaparte as First Consul*, *Œdipus and the Sphinx*, *Apotheosis of Homer*, painted in the ceiling of one of the apartments of the Louvre; *Birth of Venus*, *Jesus in the Midst of the Doctors*, *Molière in His Study*, *Virgil Reading His Æneid to Augustus*, etc.

Ingria (in'gri-à), a district of Russia, forming a part of the government of Petrograd, in which the capital, Petrograd, is situated, but at one time belonging to Sweden.

Ingrossing (in-grōs'ing), in law. See *Engrossing*.

Ingulphus (in-gul'fus), or INGULF, Abbot of Croyland, is supposed to have been born in London about 1030. He became a favorite of Edgitha, the wife of Edward the Confessor, who introduced him to William, Duke of Normandy. In 1051 he became his secretary, resigning that office in 1064, when he became a monk in the abbey of Fontenelle, in Normandy, whence he was invited to England by William, and created abbot of the rich monastery of Croyland. He died in 1109. A history of the monastery of Croyland from 664 to 1091 was long attributed to him, but is now believed to be a fabrication of the thirteenth or fourteenth century.

Inhaler (in-hā'ler), an apparatus for inhaling vapors and volatile substances, as steam of hot water, vapor of chloroform, iodine, etc.

Inhambane (in-yâm-bä'nā), a Portuguese district and seaport on the east coast of South Africa. There are cocoanut-palm, sugar-cane and rubber plantations, and coffee grows wild. Native pop. of district, 300,000. Pop. of town, 3500.

Inheritance (in-her'i-tans). See *Descent*.

Inheritance Tax. A tax or charge imposed upon the devolution of the property of a deceased person to his heirs or legatees. This is a very old form of taxation, and was first imposed in the Roman Empire to raise money for the support of the army. In England such taxes are known as 'death duties,' and were first imposed about 1780, although a stamp tax existed as early as 1694. Inheritance taxes are now in force in practically all the countries of Europe and in several of the United States. The form and rates of inheritance tax vary in the different states. Generally, however, the tax is graduated according to the amount of property involved, in several states running from 1 to 5 per cent. A federal tax on inheritances was passed by Congress in 1916, the tax being a progressive one, successively increasing from 1 per cent. on $5000 to 10 per cent. on $5,000,000, no deduction being allowed on direct bequests to children or by heads of families as in State inheritance taxes.

In the revenue measures passed in 1917 is a war estate tax, which imposes upon the transfer of each real estate of every decedent dying after the passage of this act, the transfer of which is taxable, etc., taxes graduated from one-half of one per cent of the amount of the net estate not in excess of $50,000, to a rate of ten per cent of the amount by which the net estate exceeds $10,000,000. Exemption is made in respect to estates of those dying while serving in the military or naval forces of the United States during the war existing at the time the act was passed.

In Hoc Signo Vinces (in hŏk sig'nō vin'sēz), (Latin, *In this sign thou shalt conquer*). This legend according to tradition appeared on a flaming cross in the sky to the Roman Emperor Constantine I before his battle with Maxentius.

Inia (in'i-a), a genus of Cetacea belonging to the dolphin family, containing only one known species, *I. geoffroyensis*, about eight feet in length, found in the Amazon.

Initiative and Referendum, a system of legislation by which the people of a state can either initiate measures to be enacted by their own vote into laws, or cause laws enacted by the legislature to be referred to them for approval or rejection. This system prevails in Switzerland and was adopted in South Dakota in 1898, and Oregon in 1902. In the latter state it has been actively applied and with an effect that has led various other states to adopt it, in the form of constitutional amendments. These include Montana in 1906, Oklahoma in 1907, Maine and Mis-

souri in 1908, Arkansas and Colorado in 1910. Several other states have adopted it in partial form and it is growing in popularity. In no other state, however, is it as far reaching in scope as in Oregon, and nowhere else is it in such active operation. The principle of the Initiative and Referendum has been adopted in many cities which have the commission form of government, as an important aid to its efficiency. To it, in some instances, has been added the Recall, a provision which gives the power to recall from office any official with whose conduct the public is dissatisfied. The principle of the Recall as applied to the judiciary is strenuously opposed.

Injections (in-jek'shunz), in surgery, fluids, different, according to the different effects desired to be produced, thrown by means of a small syringe into the natural cavities of the body, or those occasioned by disease. Wounds and sores are usually cleansed in this way when they extend far below the skin. In diseases of the nose, the ears, the bladder and urethra, the uterus, etc., injections are often used. Pure warm water is injected with the highest success for the removal of pus, blood, or even foreign bodies. Sometimes astringent medicines, to restrain excessive evacuations, sometimes stimulating ones, sometimes soothing medicaments, to mitigate pain, etc., are added to the water.

Injector (in-jek'tur), an apparatus for supplying water automatically to steam boilers. Feed pumps for feeding water into boilers are difficult to keep in order when driven at high speed, and some form of injector is now in general use in place of high speed pumps. The principle is to permit steam to escape from the boiler into a chamber supplied with water from without, the steam pressure being sufficient to force this water into the boiler through an aperture opening into its lower part. Injectors are in general use in locomotive boilers, in which the steam pump worked only when the engine was in motion, so that if it stood still for any length of time the water in the boiler was apt to get too low. The injector overcomes this deficiency and keeps the boiler constantly supplied with water when it is making steam.

Injunction (in-jungk'shun), a writ which issues under the seal of a court of equity, to restrain proceedings in other courts, or a prohibitory writ restraining a person or persons from doing some act which appears to be against equity, and the commission of which is not punishable by criminal law. Disobedience to an injunction constitutes contempt of court, punishable accordingly. The free use of the injunction power against labor organizations has of late years given rise to much bitter feeling.

Ink, a liquor or pigment used for writing or printing. All ordinary writing inks owe their properties to the presence of gallate or tannate of iron held in suspension by means of gum. Gall-nuts contain gallotannic acid, which gives a black precipitate with per-salts of iron; they also contain pectose, which converts gallotannic acid, when exposed to the air, into gallic acid. This latter acid colors ferric salts a much deeper black than the former acid. The essential points in the preparation of a good writing ink are therefore the presence of an iron salt, an infusion of gall-nuts and gum, and the allowing the mixture to remain for some time exposed to the air. All other substances which are added to ordinary ink as coloring matters in the place of gall-nuts only impair its quality. As ink is liable to become mouldy it is customary to add a small quantity of such substances as essential oils, carbolic acid, crushed cloves, or sometimes corrosive sublimate, in order to prevent this result. For *copying ink* a little sugar is added, which prevents it drying before a copy can be made. The so-called *alizarin inks differ* from ordinary inks in containing a little free acid, and usually also a small quantity of indigo dissolved in sulphuric acid, which prevents too pale an appearance in writing. Such inks become very black by exposure to ammoniacal fumes. Ink is sometimes prepared in cakes or powder, which when dissolved in water may be used as ordinary ink; the thickening ingredients added are usually madder and indigo dissolved in sulphuric acid. Colored writing-inks, as red, blue, etc., are simply solutions of some coloring materials, cochineal and Brazil-wood being used for red, Prussian blue for blue, etc. Gold and silver inks consist of a fine powder of the metals suspended in a solution of gum-arabic.—*Marking ink* usually consists of a solution of silver nitrate thickened with gum and sometimes colored by means of sap-green.—*Printing ink* may be made by boiling linseed-oil and burning it about a minute, and mixing it with lampblack, with an addition of soap and resin. If it be wished to obtain colored printing inks, this may be done by adding the necessary pigments to the oil while it is being heated. Vermilion is used to give a red color, ultramarine for blues, and lead chromate for yellows.—*Lithographic ink*,

used in printing from the stone, is usually composed of virgin wax, dry white soap, tallow or lard, shellac, mastic, and lamp or Paris black.—*Sympathetic inks* have been sometimes used in secret correspondence. They are of various kinds. For instance, characters written in solutions of cobalt, lemon juice, and dilute sulphuric acid make no appearance on the paper, but become visible when treated with some other solution or exposed to the action of heat.

Inkberry or WINTERBERRY (*Ilex glabra*, an evergreen shrub belonging to the holly family *Ilicinæ* with glossy leathery leaves and black berries. The pokeweed is also called by this name.

Inland Waterways. The outbreak of the European war in 1914 focused the attention of the people of the United States on the question of inland waterways, which, in the matter of national defense are indispensable to the rapid mobilization of fleets at menaced points. It gave fresh vigor to the scheme of co-ordinating the canals and waterways from north to south along the Atlantic coast. The first link of the chain connects the Boston Navy Yard with the New York Navy Yard by way of the Cape Cod Canal and Long Island Sound; the second link connecting the New York Navy Yard with the Philadelphia Navy Yard will follow the line of the antiquated Delaware and Raritan Canal; and the third, connecting the Philadelphia Navy Yard with the Navy Yard at Norfolk, is traced by the Delaware and Chesapeake Canal, which is to be improved to a ship's canal depth.

Apart from this Atlantic Intra-Coastal Route there are many other waterways in the country which have been of great service in the transportation of commerce. Chief of these are the Erie Canal connecting the Hudson River at Albany and Troy with Lake Erie at Buffalo, deepened and improved from time to time till the completion of the New York State Barge Canal in 1918; the Florida Coast Line Canal, from Mayport, Fla., to Miami, Fla., a distance of 370 miles; the Miami and Erie, from Cincinnati to Toledo, Ohio; the Chesapeake and Ohio Canal, from Cumberland, Md., to Washington, D. C. In 1917 a Committee on Inland Water Transportation was organized for the movement of freight on the Mississippi and its tributaries, the ultimate object being the establishing of barge lines between New Orleans, St. Louis and the Twin Cities. See *Canals*.

Inlaying (in-la'ing), is the art of ornamenting flat surfaces of one substance by inserting into cavities cut in them pieces of some other substance. Various kinds of metal or wood, or pearl, ivory, etc., are employed in this process. See articles on *Marquetry, Damaskeening, Buhl, Reisnerwork, Pietradura, Bidery, Mosaic.*

Inn, a house where travelers are sheltered for the profit of the provider. As a protection landlords have a lien on the goods of their lodgers (with the exception of the clothing which they are actually wearing), so that they may retain them as security for the price of their lodging and entertainment. The modern hotel is in a legal sense an inn.

Inness (in'nes), GEORGE, landscape painter, was born at Newburgh, New York, in 1825. No painter has represented the aspects of nature in the American climate with deeper feeling, a finer sentiment of light and color, or a better command of technical resources. His *American Sunset* was selected as a representative work of American art for the Paris Exposition of 1867. He died in 1894.

Innocent (in'u-sent), the name of thirteen popes, of whom only the following need be particularly dealt with:—INNOCENT I, succeeded Anastasius I as Bishop of Rome in 402. He supported St. Chrysostom, and renounced the communion with the Eastern churches on account of their treatment of that eminent man. In 409 he was sent to obtain terms of peace from Alaric, but without success. He died in 417, and is one of the most distinguished saints, his day being July 28.—INNOCENT II, a Roman of noble birth, elected pope in 1130 by a part of the cardinals, while the others elected Peter of Leon, who took the name of Anacletus. Innocent fled to France, where he was acknowledged by Louis VI and by Henry II of England; also by the Emperor Lothaire, who conducted him in 1133 to Rome, where Anacletus also maintained his claims as pope. Innocent was obliged to retire, and though reinstated in 1137 Anacletus maintained himself until his death in 1138. Innocent in 1139 held the second Œcumenical Council in the Lateran, which condemned the opinions of Arnold of Brescia, and declared the decrees of Anacletus null. Innocent died in 1143.—INNOCENT III. Lothario, Count of Segni, born in 1161, was unanimously elected pope at the age of thirty-seven. He displayed great energy, and much enhanced the papal power. He excommunicated Philip Augustus, King of France, and laid his kingdom under an interdict in 1200 because Philip had repudiated his wife, and obliged the king to submit. He extorted a similar submis-

sion from John, king of England, who refused to confirm the election of Langton as Archbishop of Canterbury, by laying the kingdom under an interdict, and in 1212 formally deposing him. Almost all Christendom was now subject to the pope, two Crusades were undertaken at his order, and his influence extended even to Constantinople. The movement against the Albigenses and establishment in 1198 of the inquisitorial tribunals, from which the Inquisition itself originated, were noteworthy events of his pontificate. In 1215 he held a council by which transubstantiation and auricular confession were reaffirmed as dogmas, and the Franciscan and Dominican orders were confirmed. Innocent died in 1216. He left various works on legal and theological subjects; and the *Stabat Mater*, *Veni Sancte Spiritus*, and other sacred hymns, are said to have been written by him.—INNOCENT XI, Benedetto Odescalchi, born in 1611, served in his youth as a soldier, took orders at a later period, and rose through many important posts, until he was elected pope in 1676, on the death of Clement X. He was eminent for probity and austerity. Though hostile to the Jesuits, whose opinions he attacked in the decree *Super quibusdam axiomatis moralibus*, yet he was obliged to condemn Molinus and the Quietists. Being involved in a dispute with Louis XIV, the authority of the pope in France and elsewhere received a severe blow in the *IV Propositiones Cleri Gallicani* (Four Propositions of the Gallican clergy, 1682). These disputes were highly favorable to the English Revolution, as it induced the pope in 1689 to unite with the allies against James II, in order to lower the influence of Louis XIV. He died in 1689, and was succeeded by Alexander VIII.

Innocents, FEAST OF HOLY, variously styled Innocents' Day and Childermas, a festival observed in the Western Church (including the Anglican) on the 28th, and in the Eastern Church on the 29th December, in commemoration of the massacre of the children at Bethlehem by the order of Herod.

Innsbruck (ins'prook), a town of Austria, capital of the Tyrol, beautifully situated on the Inn, near the confluence of the Sill, surrounded by striking groups of lofty mountains. Among the chief buildings are the Hofkirche or Franciscan Church, containing the splendid tomb of the Emperor Maximilian I and the tomb of Hofer; the church of St. James; the imperial castle or palace; the Golden Roof, a sort of oriel window roofed with gilt copper, and projecting in front of a building originally a palace of Count Frederick of Tyrol; the town-house; the Capuchin monastery; the university; and the provincial museum. It has manufactures of textiles, substitutes for coffee, etc. Pop. 53,194.

Inns of Chancery, in London, nine institutions named Thavie's Inn, New Inn, Symond's Inn, Clement's Inn, Clifford's Inn, Staple's Inn, Lyon's Inn, and Barnard's Inn, formerly preparatory colleges for law students.

Inns of Court, four very ancient societies in London exclusively invested with the right to call to the English bar; also the buildings belonging to these societies, in which the members dine and barristers have chambers. The gentlemen belonging to these societies may be divided into benchers, outer barristers, inner barristers, and students. The benchers are the highest in rank, being usually Queen's Counsel, and it is they who have the right of granting or refusing a call to the bar, or of disbarring persons unfit to practise. The four inns of court are the Inner Temple and Middle Temple (formerly the dwelling of the knights templar, and purchased by some professors of law more than three centuries since); Lincoln's Inn and Gray's Inn (anciently belonging to the earls of Lincoln and Gray). Each inn is self-governing, and all have equal privileges. In each inn building there is a hall, chapel, library, etc., besides sets of chambers occupied by barristers and solicitors. Previously to being called to the bar it is necessary to be admitted a member of one of the inns of court and to go through a certain course of legal study and 'keeping terms.' Any person who has passed a public examination at any university in the British dominions may be at once admitted as a student to any of the inns. Every other person must pass an examination in the English and Latin languages and English history before a joint board appointed by the four inns. No solicitor, parliamentary agent, clerk to justice of the peace, or to any barrister, conveyancer, solicitor, etc., can be admitted as a student until such person ceases to act in any of these capacities and has taken his name off the roll of any court on which it may stand. The educational year is divided into three terms. Attendance is not compulsory on students either at lectures or private classes; nor is it essential to study the practice of law in the chambers of a barrister or pleader, though this is recommended. A term is kept by the student being present at six dinners during the term in the hall of the society to which

he belongs, or three if he is a member of one of the British universities. Students are required to pass an examination in Jurisprudence, Roman Civil Law, Constitutional Law and Legal History, the Law of Real and Personal History, Common Law, Equity, and Criminal Law, there being four examinations in each year.

Inoculation (in-ok-ū-lā'shun), in medicine, the introduction, by a surgical operation, of a minute portion of infective matter into contact with the true skin, for the purpose of exciting artificially a milder form of some contagious disease, and thereby protecting the human system against similar attacks in future; keeping in mind, however, that such a process can be only of efficacy in regard to diseases which attack us only once in the course of our lives, such, for instance, as smallpox. The term is chiefly used in connection with smallpox. The practice of inoculation with material taken from a smallpox patient, long followed in parts of Wales, was seemingly scarcely known throughout England till the early part of the eighteenth century, and its adoption was chiefly due to the exertions of Lady Mary Wortley Montagu, who became acquainted with it in Turkey. For many years the practice met with the greatest opposition, both from the medical profession and the clergy; but later it came extensively in vogue, the smallpox thus induced being of a milder and much less often fatal type than ordinary smallpox. The great objection to it was that it tended to spread this serious disease, inoculated smallpox being equally infectious with the other kind. After the discovery of vaccination by Jenner, in 1798, inoculation was gradually superseded, and the British legislature even prohibited the latter, while making vaccination compulsory. See *Smallpox* and *Vaccination*.

Inosite (in'o-sīt; $C_6H_{12}O_6$), a saccharine substance, isomeric with glucose, found in the muscular substance of the heart, in the lungs, kidneys, brain, etc. In 'Bright's disease' it has been found in the urine, and it exists also in several plants.

Inouye, KAORU, COUNT, a Japanese statesman, born in the province of Chosku in 1839. He made a secret journey to Europe with Count Ito, serving as a common sailor on the voyage; and on their return they, at the risk of their lives, advocated the adoption of Western methods. After the restoration, in 1868, he was constantly employed by the government, as minister of public works and foreign secretary. He was raised to the peerage in 1885 and made minister of the interior in 1892.

Inowraclaw (ē-nov-râts'lâf), or JUNG-BRESLAU, a town of Prussia, province of Posen. It has large beds of rock-salt and saltpeter-works. Pop. 26,141.

In Partibus Infidelium (literally, 'in parts belonging to infidels'), the title given since the thirteenth century to bishops appointed by the pope in countries where his sway is not recognized, and who, having no proper diocese, take their title from a territory which may have once formed a see, but does no longer; thus Roman Catholic bishops in Britain formerly had such titles as 'Bishop of Nicopolis,' 'Bishop of Anazarba.'

Inquest (in'kwest), See *Coroner*.

Inquisition (in-kwi-si'shun), in the Roman Catholic Church, a court or tribunal established for the examination and punishment of heretics. The institution was founded in the twelfth century by Father Dominic, who was charged by Pope Innocent III with orders to incite Catholic princes and people to oppose heretics. Pope Gregory IX in 1233 completed the design of his predecessors, and the Inquisition was successively introduced into several parts of Italy, and, with certain limitations, into some provinces of France. It never managed to establish itself in England at all. The tribunals of faith were admitted into Spain in the middle of the thirteenth century; but a firm opposition was made to them, particularly in Castile and Leon, and the bishops there maintained their exclusive jurisdiction in spiritual matters. A change, however, afterwards took place; and while in other countries of Europe the Inquisition could never obtain a firm footing—in some falling entirely into disuse, as in France—in Spain it became a political engine towards the end of the fifteenth century, under Ferdinand and Isabella, who used it as a weapon to break the strength of the nobles, and to render the royal authority absolute. In 1477, when several turbulent nobles had been reduced in the southern part of Spain, Queen Isabella went with the Cardinal Pedro Gonzalez de Mendoza to Seville, where this prelate, as Archbishop of Seville, made the first attempt to introduce the Inquisition, especially with regard to citizens of Jewish origin. After this the design was disclosed of extending it over the whole country. In the assembly of the states held at Toledo, 1480, the erection of the new tribunal was urged by the cardinal, and after some oppo-

sition established under the name of the General or Supreme Inquisitor. The new court was opened in Seville in 1481. Torquemada, prior of the Dominican convent at Segovia, and father-confessor to the Cardinal Mendoza, had already been appointed by Ferdinand and Isabella the first grand inquisitor in 1478. The Dominican monastery at Seville soon became insufficient to contain the numerous prisoners, and more than 2000 persons are said to have been burned alive in the first year or two. The pope, however, opposed the establishment of the Spanish Inquisition as the conversion of an ecclesiastical into a secular tribunal, and repeatedly summoned the inquisitor-general to Rome. Torquemada, instead of obeying, sent a friend to defend his cause, and in 1483 Sixtus IV was obliged to yield and acknowledge Torquemada as inquisitor-general of Castile and Leon, and a later bull subjected Aragon, Valencia, and Sicily to the inquisitor-general of Castile. The introduction of the new tribunal was attended with risings and opposition in many places, as at Saragossa, but the people were obliged to yield in the contest. The tribunal was wholly dependent on the Spanish sovereigns, and became a powerful instrument for establishing the arbitrary power of the king on the ruins of the national freedom; for putting down the clergy, who had previously acknowledged only the jurisdiction of the Roman see; and for oppressing the nobles, and taking away the privileges of the estates. The property of those who were condemned fell to the king; and, although it had been granted to the Inquisition, it was still at his disposal. Ferdinand and Isabella, indeed, devoted a part of this property to found convents and hospitals; but the church, notwithstanding, lost many possessions by means of the Inquisition. It is computed that there were in Spain above 20,000 officers of the Inquisition, called *familiars*, who served as spies and informers. These posts were sought even by persons of rank, on account of the great privileges connected with them. The supreme tribunal, under the inquisitor-general, sat at Madrid. He was assisted by a council of six or seven, and there were various officials belonging to the court, the one specially appointed to carry on prosecutions being called the fiscal. As soon as an accuser appeared, and the fiscal had called upon the court to exercise their authority, an order was issued to seize the accused. If he did not appear at the third summons he was excommunicated. From the moment that the prisoner was in the power of the court he was cut off from the world. The advocate who was appointed to defend him could not speak to him except in the presence of the inquisitors. The accused was not confronted with the accuser nor the witnesses before the court, neither were they made known to him; and he was often subjected to the torture to extort a confession, or to explain circumstances which had not been fully explained by the witnesses. Imprisonment, often for life, scourging, and the loss of property, were the punishments to which the penitent was subjected. Wearing the *san-benito*, or vest of penitence,—a sort of coarse yellow tunic, with a cross on the breast and back, and painted over with devils—was a common method of punishment, the penitent having to wear it for a fixed period. When sentence of death was pronounced against the accused the *auto da fe*, or ceremony of burning the heretic in public, was ordered. This usually took place on Sunday, between Trinity Sunday and Advent. As 'the church never pollutes herself with blood,' a servant of the Inquisition, at the close of the procession and ecclesiastical ceremonial preceding the execution of the sentence, gave each of those who had been sentenced a blow with the hand, to signify that the Inquisition had no longer any power over them, and that the victims were abandoned (*relaxados*) to the secular arm. A civil officer, 'who was affectionately charged to treat them kindly and mercifully,' now received the condemned, bound them with chains, and led them to the place of execution. They were then asked in what faith they would die. Those who answered the Catholic were first strangled; the rest were burned alive. Even in more modern times the original organization of the Inquisition was but little changed, but the *auto da fe* was seldom witnessed after the sixteenth century. The powers of the court latterly became more limited, however, by various restrictions, and at last, under Joseph Bonaparte, it was abolished altogether in 1808. It was reëstablished in 1814 by Ferdinand VII, but on the adoption of the constitution of the Cortes, in 1820, it was again abolished. According to the estimate of its historian, Llorente, the number of victims of the Spanish Inquisition from 1481 to 1808 amounted to 341,021, a gross exaggeration, according to Prescott. Of this number, 32,000 were burned.

The Inquisition, abolished for Italy by Napoleon in 1808, restored in Rome by Pius VII in 1814, still exists, nominally at least, as one of the 'congregations.' The censorship of the press was under it

Insanity (in-san'i-ti), a general term comprising every form of intellectual disorder, whether consisting in a total want or alienation of understanding, as in idiocy, or in the diseased state of one or several of the faculties. Medical writers have adopted different systems of classification in their treatment of this subject; but perhaps the most convenient is that which comprises all mental diseases under the four heads of mania, melancholy, dementia or fatuity, and idiocy. *Idiocy* is either a congenital or an acquired defect of the intellectual faculties. Congenital idiocy may originate from a malformation of the cranium, or of the brain itself. Acquired idiocy proceeds from mechanical injury of the cranium, or from injury or disease of the brain, from excess in sensual indulgences, etc. (See *Idiot.*) *Dementia* is marked confusion of thoughts, loss of memory, childishness, a diminution or loss of the powers of volition, and general weak-mindedness; it differs from idiocy in being curable. *Cretinism*, sometimes given as a separate category, is a form of idiocy associated with a characteristic malformation of the body. *Mania* is a species of mental derangement characterized by the disorder of one or several of the faculties, or by a blind impulse to acts of fury. Adults are the principal subjects. Females are more exposed to it than males. Violent emotions, a dissipated life, excess in any indulgence, sometimes produce it. It is sometimes cured, but sometimes remains stationary, and sometimes is converted into dementia. *Melancholy* is a species of mental disorder consisting in a depression of spirits. Some dark or mournful idea occupies the mind exclusively, so that by degrees it becomes unable to judge rightly of existing circumstances, and the faculties are disturbed in their functions. Several kinds of melancholy are distinguished; the distinctions are founded, however, mostly on the causes of the disease, among the more important of which are love, religious views, repeated failures to reach an earnestly desired end, a sudden nervous shock, and the like. The course of the disease is various; sometimes it lasts a series of years; sometimes it ceases of itself, or is cured by medical aid. Very frequently melancholic patients commit suicide, a tendency that is not to be overlooked. In it also bodily health is likely to be neglected, thus leading to certain other diseases. See *Lunatic Asylum*, *Lunacy*, *Non compos mentis*, etc.

Inscriptions, records, not of the nature, of a book, engraved or inscribed on stone, metal, clay, or other durable material. Inscriptions of this kind remain in many cases our sole source of knowledge of long periods of ancient history. Probably more than 150,000 inscriptions have been found of varied character, and an extensive literature has grown up around them. Very many of them are mortuary epitaphs. Far more important are records of events in the history of kings, commercial contracts and religious inscriptions.

Insecticides (in-sek'ti-sīdz), substances, not necessarily poisonous, used to prevent or destroy the insect enemies of plants. Biting or gnawing insects are destroyed by mixtures of arsenic, such as Paris green, arsenate of lead, and London purple; sucking insects by suffocating substances, such as soap, sulphur and hyrocyanic-acid gas.

Insectivora (in-sek-tiv'o-ra), an order of mammals living to a great extent on insects. They are plantigrade, and have a well-developed clavicle, a discoidal placenta, incisor teeth larger than the canine, and molar teeth set with sharp conical cusps. They are usually of small size, and many of them live underground. They are found throughout the world, with the exception of Australia and South America. The chief insectivorous families are the Talpidæ or moles, the Soricidæ or shrew-mice, and the Erinaceidæ or hedgehogs.

Insectivorous Plants, plants which derive nourishment from the insects entrapped by them. See *Dionæa*, *Sundew*, *Pitcher-plant*.

Insects. See *Entomology*.

Insertion (in-sēr'shun), in botany, the place or mode of attachment of an organ to its support. Insertion is described as *epigynous* when on the summit of the ovary, *hypogynous* when beneath the ovary, and *perigynous* when upon the calyx surrounding the ovary.

Insessores (in-se-sō'rēz), in ornithology, the perchers or passerine birds, an extensive order of birds, comprehending all those which live habitually among trees, with the exception of the birds of prey and the climbing birds. The toes, which are three before and one behind, are specially adapted for perching and nest-building. These birds live in pairs, build in trees, and generally display great art in the construction of their nests. In them the organ of the voice attains its utmost complexity, and all our singing birds belong to the order. The form of the beak varies widely, and this has led to the establishment of four

important subordinate groups. (1) The *Conirostres*, or 'conical-beaked' Insessores; (2) The *Dentirostres* or 'tooth-beaked' perchers; (3) The *Tenuirostres*, or slender-beaked perchers; (4) The *Fissirostres*, or cleft-beak (swallows, swifts, goat-suckers, etc.). In modern classifications the Fissirostres are generally excluded from the order, which is also divided otherwise. Two main divisions, the *Acromyodi* or singing-birds and the *Mesomyodi* or songless birds, are now generally recognized, the distinctive characters being based on the structure of the larynx. The former, again, are divided into the *Turdiformes*, or thrush-like birds; the *Fringilliformes*, or finch-like birds; and the *Sturniformes*, or starling-like birds. See also *Ornithology*.

A, Head of Hoopoe (*Upupa epops*), showing the tenuirostral type of beak. B, Head of Red-backed Shrike (*Lanius collurio*), showing the dentirostral type of beak. C, Head of White-bellied Swift (*Cypselus melba*), showing the fissirostral type of beak. D, Head of Corn-bunting (*Emberiza miliaria*), showing the conirostral type of beak. E, Foot of the Yellow Wagtail (*Motacilla sulphurea*). F, Foot of a Finch (*Fringilla*).

Insignia (in-sig'ni-a), the name given to all outward marks of power and dignity, such as the golden crown, the ivory chair, and the twelve lictors with their axes in the time of the Roman kings; the crowns and scepters of European monarchs; the pallium, the infula, the staff, and ring of the higher orders of the Roman Catholic priesthood. The name of insignia is also applied to the decorations worn by the different orders of merit.

Insolvency (in-solv'en-si). See *Bankrupt.*

Inspiration (in-spi-rā'shun), in theology, is the infusion of ideas into the human mind by the Holy Spirit. By the *inspiration of the Scriptures* is meant the influence of the Holy Spirit exercised on the understandings, imaginations, memories, and other mental faculties of the writers, by means of which they were qualified for communicating to the world divine revelation, or the knowledge of the will of God. Theological writers have enumerated several kinds or degrees of inspiration, which are founded upon the supposition that God imparted to the sacred penmen that measure and degree of assistance which was just suited to the nature of the subjects which they committed to writing, and did not supersede the use of their natural powers and faculties, and of their acquired knowledge, where these were sufficient. Thus distinctions have been drawn between inspiration of direction, inspiration of superintendency, inspiration of elevation, and inspiration of suggestion. All orthodox theologians agree in ascribing divine assistance to the scriptural writers, but differ widely as to the degree, extent, and mode of inspiration. The advocates of *plenary* inspiration assert that every verse of the Bible, every word of it, every syllable, every letter is the direct utterance of the Most High. In opposition to this theory some writers confine inspiration to all that is directly religious in the Bible, to all that is matter of direct revelation, leaving out of the question all that can be known by ordinary intellectual application. Other authorities attribute inspiration only to the spirit, ideas, or doctrines of the Scriptures, exempting the strict form or letter. Some go yet further, and include in the fallible sections the mode of argument and expository details.

Insterburg (ēn'ster-burg), a town of Prussia, province of East Prussia, 16 miles west from Gumbinnen, at the confluence of the Angerap and Inster, which here form the Pregel. It has iron-foundries, distilling, brewing, manufactures of linen, leather, and earthenware, etc. Pop. (1910) 31,627.

Instinct (in'stinkt), the power by which, independently of all instruction or experience, and without deliberation, animals are directed to do spontaneously whatever is necessary for the preservation of the individual, or the continuation of the kind. Three main

theories have been held with regard to instinctive actions:—(1) That these various impulses and faculties were bestowed by the Creator upon each species as its necessary and characteristic outfit. (2) That instinct is the accumulated results of individual experience, fixed by repetition, and transmitted as an inheritance to succeeding races. In this view instinct is intelligent in its origin, an organized experience, a 'lapsed intelligence.' (3) That the greater number of complex instincts arise through the natural selection of variations of simpler instinctive actions—variations arising from unknown causes. The last theory is that of Darwin.

Institute of France (in-sti-tūt), the principal philosophical and literary society of France, organized after the first storm of the French Revolution in 1795, to replace the Académie Française, the Académie des Sciences, and the Académie des Belles Lettres et Inscriptions, its object being the advancement of the arts and sciences. The Institute now embraces five distinct divisions or *académies*, each having a separate field of knowledge or thought: (1) The *Académie Française*, originally established early in the seventeenth century. Its department is the French language and literature, and its ordinary members number 40. (2) The *Académie des Inscriptions et Belles Lettres;* ordinary members, 40. (3) The *Académie des Sciences;* ordinary members, 65. (4) The *Académie des Beaux Arts;* ordinary members, 40. (5) The *Académie des Sciences, Morales, et Politiques;* ordinary members 40. Each academy has an independent organization and a free disposition of the funds committed to it. Members are elected for life by ballot, and have an annual salary of 1500 francs. To each academy are attached a certain number of honorary members and foreign associates. Admission into the Académie Française is a great object of ambition with most French literary men. The name of this distinguished body was changed in 1848 to *Institut National de France*, having previously been called *National, Imperial*, and *Royal* at different times.

Institute for Medical Research, an important institution founded in New York by John D. Rockefeller, and endowed by him with funds amounting in all to $8,400,000. Its purpose, as at present constituted, is that of research into the causes of obscure diseases, and it seems calculated to prove of immense benefit. A new hospital has been added to it, with 70 beds, to be confined to those suffering from specified diseases which are under special examination by the faculty. At present these are confined to infantile paralysis, pneumonia and heart disease, in order that an exhaustive study of these diseases may be made.

Institutes, a book of elements or principles; particularly a work containing the principles of a system of jurisprudence; as the *Institutes* of Justinian; the *Institutes* of Gaius; Erskine's *Institutes* of the Law of Scotland.

Instrument (in'strö-ment), in music, any mechanical contrivance for the production of musical sound. Musical instruments are divided into three kinds—wind-instruments, stringed instruments, and instruments of percussion. The chief modern stringed instruments are the violin, viola, violoncello, and double bass, the harp, mandolin, guitar, and piano; the chief wind-instruments, the flute, oboe, bassoon, clarinet, basset-horn, serpent horn, trumpet, trombone, ophicleide, and organ; the chief percussion instruments, the drum, tambourine, cymbals, and triangle.

Instrumental Music, music produced by *instruments*, as contradistinguished from *vocal* music. Instrumentation is quite a modern art, and may be said to have been first cultivated to any purpose among the Italians, who up until the middle of eighteenth century, however, used only instruments of the viol kind, and who even yet are sparing in their use of wind instruments. In Italy, Leo, Durante, Jomelli, and Majo; in France, Rameau; in Germany, Haydn and Mozart, deserve the credit of carrying the art to a perfection up to their time undreamed of. Further developments of an important character are due to Berlioz and Wagner.

Insulator (in'sū-lā-tur), a body used to separate an electrified conductor from other bodies, and which offers very great resistance to the passage of electricity. Glass, shellac, resins, sulphur, ebonite, gutta-percha, silk, and baked wood are notable insulating materials. The cut shows the usual forms of insulators in telegraph lines to support the wires on the posts. They are usually made of porcelain or glass.

Insulator.

Insurance (in-shör'ans), is a contract whereby, for a stipulated consideration, called a *premium*,

one party undertakes to indemnify another against certain risks. The party undertaking to make the indemnity is called the *insurer* or *underwriter*, and the one to be indemnified the *assured* or *insured*. The instrument by which the contract is made is denominated a *policy;* the events or causes of loss insured against, *risks* or *perils;* and the thing insured, the *subject* or *insurable interest*. *Marine* insurance relates to property and risks at sea; insurance of property on shore against fire is called *fire* insurance. *Life* insurance, in its widest sense, is a contract entered into by the insurer to pay a certain benefit contingent upon the duration of one or more lives. Besides these classes of insurance there are many others: the traveler may insure himself against loss entailed from damage by rail or sea; the farmer from the inroads of disease among his live stock; the employer from the fraud of a dishonest cashier, etc. Our attention will, however, be confined to the first three divisions.

The practice of marine insurance seems to have long preceded insurances against fire and upon lives, and probably dates from the end of the fourteenth or beginning of the fifteenth century. It is, however, contended, on the authority of Livy, that traces of the practice may be found during the second Punic war, while other writers, founding on a passage of Suetonius, ascribe the introduction of the principle to the Emperor Claudius. Nearer our own day, there are extant rules of sundry guilds or social corporations of the Anglo-Saxons, whereby, in consideration of certain contributions, the members guarantee each other against loss from fire; water, robbery, or other calamity. Insurance, viewed in its commercial aspect, however, seems to have been first undertaken in Flanders. It is probable, from a statement in 43 Eliz. chap. xii, that insurance was introduced into England by the Lombards early in the sixteenth century.

While all fire and life assurances are made at the risk of companies which contain within themselves the requisites of security, wealth, and numbers, a large proportion of marine insurances is made at the risk of individuals called underwriters. The London underwriters form an influential society known as Lloyd's. As a small number of risks would not secure a safe average to the individual insurer, owing to the great hazard property at sea is exposed to, he prudently takes but a fractional part of the entire risk on himself, and this is effected by subscribing or *underwriting* the stipulated proportion on a policy drawn out for the entire sum to be covered. The necessity for circulating the policy and negotiating the insurance has given rise to the business of the *insurance broker*, with which, however, that of the underwriter is frequently combined. Policies are either *valued*, where the insurance is based on a specific bill of lading, or *open*, where in the case of loss, the value of a vessel with her stores is estimated as at the date of sailing, her freight at the amount she would have earned had the voyage been successfully accomplished, and her cargo at its invoice price, adding premium and all charges. The losses against which the insured is not protected are:—1. Acts of the government, such as the destruction of goods in quarantine. 2. Breach of the revenue laws. 3. Consequences of deviation from the terms of the policy. 4. Breaches of the law of nations, such as failure in attempting to run a blockade. 5. Unseaworthiness, or incompetency of the master. 6. Loss arising from unusual protraction of the voyage. 7. Liability for doing damage to other vessels. 8. Average (which see).

Fire insurance is a contract of indemnity by which the insurer, in consideration of a certain premium, undertakes to indemnify against all loss or damage in buildings, stock, goods, etc., by fire during a certain period. Insurances of this nature are hardly ever made by individuals, but almost invariably by corporations and joint-stock companies. Fire insurance has been practised in Britain for nearly two centuries, but was introduced considerably later on the European continent and in America. At an early period after its institution it was considered in Britain a legitimate subject for taxation, the tax, however, being abolished in 1869. No such tax has ever been imposed in the United States. Insurances are generally divided into common, hazardous, and doubly hazardous, the premium increasing with the degree of risk. Nothing can be recovered from the insurers in the event of loss unless the party insuring had an interest or property in the subject insured at the time the insurance was effected and when the fire happened. Sometimes no single office will insure to the required amount; in such a case it is done by different offices. Fire insurance being a contract of indemnity, it is only the actual loss that can be recovered. The premises must not be materially altered, except by arrangement, during the risk, otherwise the policy will be void. The policy will also be vitiated should there be any misrepresentation or omission in the description of the subject insured, and the insurers do not hold themselves liable

for loss or damage by foreign enemy, riot, civil commotion, or military or usurped power.

Life insurance is a much simpler contract in many respects than either of the preceding. There can be but one loss, that caused by death, and therefore there is no partial loss nor average. The rate of 3 per cent. has generally been adopted as a basis for the calculation of premiums. Life insurance companies are divided into three classes. The first consists of corporations or joint-stock companies, who undertake to pay fixed sums upon the death of the party insuring with them; the profits of such societies are wholly divided among the proprietors. The second class is formed on the basis of mutual insurance, the members themselves being the company, and liable to each other for all claims, the profit accruing therefrom being from time to time allotted to the insured, generally in the form of bonuses. The third class, or mixed companies, are proprietary companies charging such increased rates as will yield a bonus, but which, in return for the working expenses and guarantee of their capital, reserve a stipulated portion of their profits for their proprietors. It is impossible to say with certainty which is the preferable form. Life insurance not being a contract of indemnity, a person may insure in as many offices as he likes, and his executors will recover the full amount from each of the insurers. It is legal for a wife to insure her husband's life, as she is dependent upon him for support; or for a husband to insure his wife's if she has an annuity or property settled upon her for life in which he has an interest; or for a creditor to insure his debtor's life. The policy is void where obtained by false representations. Life insurances are often assigned as a security for debt; the assigner binds himself to pay the premiums. Every life insurance company is bound to prepare a yearly statement of its revenue and of its balance-sheet according to prescribed forms, and must cause certain periodical investigations to be made into its affairs, and prepare and furnish to shareholders and policyholders periodical statements of its business.

Government Insurance. A Bureau of War Risk Insurance was created by act of Congress on September 2, 1914, insuring American vessels and their cargoes against the risks of war. Insurance was extended to cover the masters, officers and crews in June, 1917. A still further extension of the activities of the bureau was embodied in the War Risk Insurance Bill passed by Congress on October 6, 1917, providing insurance for all persons in any branch of the military service of the nation. The law provided that soldiers and sailors might apply for insurance in multiples of $500 for any sum not exceeding $10,000 for each applicant on a yearly-renewable-term basis. The premiums, payable monthly, are graded according to age, and average $8 per $1000 per year. The insurance, which is not compulsory, provides for either death or disability.

Intaglio (in-tăl'yō; Ital., from *intagliare* to incise, cut into), a precious stone or gem in which the subject is hollowed out so that an impression from it would present the appearance of a bas-relief. The word is applied to a new method of newspaper printing, introduced into America from Germany, also called the Mertens process. In ordinary processes newspaper illustrations are printed from lines of type upon whose *raised* dots, previously inked, a sheet of paper is pressed, carrying away an inked impression; but by the intaglio process the printing is done from the surface of infinitely minute depressions.

Interdict (in'tėr-dikt), an ecclesiastical censure in the Roman Catholic Church, the effect of which, taken in its most extended sense, is, that no kind of divine service is celebrated in the place or country under the sentence; the sacraments are not administered, the dead not buried with the rites of the church. This interdict is called *real* or *local*, while the personal interdict regards only one or more persons.

Interest (in'tėr-est), the allowance made for the loan or retention of a sum of money which is lent for, or becomes due at, a certain time; this allowance being generally estimated at so much per cent. per annum, that is, so much for the use of $100 for a year. The money lent or forborne is called the *principal;* the sum paid for the use of it, the *interest.* The *rate of interest* is the proportional amount as compared with the principal for the use of money, as six per cent. for 100 cents of principal. Interest is either *simple* or *compound. Simple interest* is that which is allowed upon the principal only, for the whole time of the loan or forbearance. *Compound interest* is that which arises from any sum or principal in a given time by increasing the principal, at fixed periods, by the interest then due, and hence obtaining interest upon both interest and principal. The rate of interest, supposing the security for the principal to be equal, depends obviously upon what may be made by the employment of money in various industrious undertakings, or on the rate of

profit. Where profits are high, interest is high, and *vice versa;* in fact, the rate of interest is simply the net profit on capital. Besides this, however, the interest on each particular loan must further vary according to the supposed risk of the lender, the supposed solvency of the borrower, etc. In Europe formerly the imposition of interest was alternately prohibited and permitted, the clergy being generally unfavorable to the practice. Calvin was among the first to expose the error and impolicy of prohibition. In 1546 it first received a parliamentary sanction in England, and it was fixed at 10 per cent.; in 1624 it was reduced to 8, in 1651 to 6, and in 1724 to 5, at which rate it remained till 1854, when all usury acts were repealed. Similar reductions have taken place in the United States, high rates of interest prevailing in newly settled regions and low ones in the older districts, 5 per cent. being a common rate in the large cities and thickly settled States.

Interference (in-tėr-fēr'ens), in physics, the mutual action of waves of any kind (whether those in water, or sound, heat, or light waves) upon each other, by which, in certain circumstances, the vibrations and their effects are increased, diminished, or neutralized. When two minute pencils of light, radiating from two different luminous points, and making a small angle with each other, fall upon the same spot of a screen or a piece of paper, it is found that in some cases they illuminate the paper or screen more strongly than either would have done singly, and sometimes they destroy each other's effects and produce a black spot or fringe. Such phenomena have been explained in accordance with the undulatory theory of light, and furnish a strong argument in favor of that theory. The interference of waves of sound is a phenomenon which may be frequently observed in the *beat* of the tones of the heavier organ pipes. Again, to a person situated in the middle of a bell the sound waves from the vibrating segments of the bell interfere and produce only a moderate loudness, whereas to a person at a short distance outside the edge the loudness is intolerable.

Interior, DEPARTMENT OF THE, organized in 1849, one of the administrative departments of the United States government. Its head is the secretary of the Interior, a member of the Cabinet. It supervises all public lands and patents, education, the census, pensions, the territories, Indian affairs, etc.

Interlaken (in-ter-lä'k'en; 'between the lakes'), a village in Switzerland, in the canton, and 26 miles S. E. of Berne, beautifully situated near the left bank of the Aar, between the lakes of Thun and Brienz, much resorted to by tourists. Pop. 3747.

Interlude (in'tėr-lūd), originally an entertainment exhibited on the stage between the acts of a play, or between the play and the afterpiece, to amuse the spectators while the actors rested or shifted their dress, or the scenes and decorations were changed. In England dramas appear to have borne this name from the time they superseded the miracle and mystery plays till the period of the Elizabethan drama. The name is also given to a brief piece of church music, prepared or extempore, for the organ, and played after each stanza except the last of a metrical psalm or hymn.

Interment (in-tėr'ment). See *Burial.*

Intermezzo (in-tėr-met'so), in dramatic literature, nearly the same as interlude, a short musical piece, generally of a light sparkling character, played between the parts of a more important work, such as an opera, drama, etc. Pieces intended for independent performances are sometimes designated by this name by the French and the Italians.

Intermittent Fever. See *Malaria.*

Internal Revenue, money collected by the United States Government from taxes aside from those on imported goods. The first tax of this kind was laid in 1791 on distilled spirits. Taxes were afterwards laid on carriages and several other articles, and in 1798 a tax of $2,000,000 was apportioned among the States, it being proposed that it should be levied on dwellings, land, and slaves. This was done on account of a threatened war with France. On the recommendation of President Jefferson, all internal taxes were repealed in 1802, and no others were authorized until 1813, when the war with England made an increased revenue necessary. Taxes were laid on a considerable variety of articles, and they were maintained into 1818, for the purpose of paying the debt incurred during the war. After 1818 no such taxes were levied until 1861, when the Civil war rendered an increased revenue necessary. In 1861 a direct tax of $20,000,000 was apportioned among the States, though it was not collected until a year later. On July 1, 1862, an internal revenue act was passed, taxing a great variety of articles, and also incomes, sales, legacies, etc. Many similar taxation acts were passed during the following six years, enormous

revenues being raised, which the exigency of the case induced the people to submit to without opposition. After the war ceased a policy of reduction of taxation was introduced, various acts being passed in 1866, 1867 and 1868, while in 1872 all stamp taxes, except that of two cents on checks, drafts and orders, were abolished. After the latter date reduction went on until internal taxes were restricted to spirits, fermented liquors, tobacco and bank circulation, and by an act of 1886, oleomargarine. During the brief war with Spain, in 1898, special taxes were again levied, but were quickly abolished after the war. At present, in addition to the tax on spirits, fermented liquors, tobacco and oleomargarine, taxes are levied on adulterated butter, filled cheese, opium, mixed flour, playing cards, bank circulation and notes paid out by banks and bankers. A bill taxing corporations was passed by Congress in 1909, which yields many millions of dollars annually to the treasury; and by the Sixteenth Amendment to the Constitution of the United States, ratified in 1913, Congress was given power to impose an income tax. See *Income Tax*.

International Arbitration

(in-tĕr-nash'un-al). See *Arbitration, International.*

International Language.

See *Esperanto.*

International Law,

the law of nations; those rules or maxims which independent political societies or states observe, or ought to observe, in their conduct towards one another. International law is divisible into two heads, the one which regulates the rights, intercourse, and obligations of nations, as such, with each other; the other, which regulates the rights and obligations more immediately belonging to their respective subjects. Thus the rights and duties of ambassadors belong to that head which respects the nation in its sovereign capacity; and the rights of the subjects of one nation to property situated within the territory of another nation, belong to the latter head. Some of the maxims regarding the rights and duties of nations during a state of peace are:—(1) Every nation is bound to abstain from all interferences with the domains of other nations. (2) All nations have equal and common rights on the high seas, and they are not bound to admit any superiority there. The sea which washes the coast of a nation, to the extent of three miles, is now deemed to be a part of the territory of the nation, over which it may exercise an exclusive jurisdiction. And, in respect to persons subjected to its laws, every nation now claims a right to exercise jurisdiction on the high seas, for the purpose of enforcing both international law, and its own municipal regulations. (3) No nation has a right to pursue any criminal or fugitive from justice in a foreign country; its claim, if any, is a mere right to demand him from the nation in which he has taken refuge. (4) Every nation has a right to regulate its own intercourse and commerce with other nations. (5) Foreigners are bound to obey the laws of a country as long as they reside within it, and under its protection; and the property held by foreigners within a country ought to be protected in the same manner as that of natives. (6) Every nation has a right to send and receive ambassadors and other public ministers; and this right of embassy has always been deemed peculiarly sacred. Their persons are held sacred and inviolable. Their property, their servants and retinue enjoy a like privilege. (See *Ambassador.*) (7) It is through the medium of ambassadors and other public ministers that treaties, conventions, and other compacts between nations are usually negotiated, thus forming a positive code for the regulation of their mutual rights, duties, and interests. In the modern practice of nations such treaties and compacts are not generally deemed final and conclusive until they have been ratified by the respective governments to which the negotiators belong.

War introduces an entirely new order of rules. The right of declaring war results from the right of a nation to preserve its own existence, its own liberties, and its own essential interests. In a state of nature men have a right to employ force in self-defense; and when they enter into society this right is transferred to the government, and is an incident to sovereignty. What are just causes for entering into a war is a question which has been much discussed by publicists. Defensive wars are necessarily justifiable from the fact that they involve the existence of safety of the nation and its interests. But offensive wars are of a very different character, and can be justified only in cases of aggravated wrongs or vital injuries. The first effect of a declaration of war is to put all the subjects of each of the nations in a state of hostility to each other. All the property belonging to each is deemed hostile. If it be personal property it may be captured as prize; if lands, it may be seized and confiscated at the pleasure of

the sovereign; if it be merely in debts or stock it may, in the extreme exercise of the laws of war, be equally liable to confiscation. As soon as a battle is over the conquerors are bound to treat the wounded with kindness, and the prisoners with a decent humanity. And there are some things which seem positively prohibited from their cruelty and brutal barbarity; such are the violation of female captives, the torturing of prisoners, the poisoning of wells, the use of inhuman instruments of war. In time of war there is occasionally an intercourse between the belligerents which should always be held sacred. Thus the interchange of prisoners by cartels; the temporary suspension of hostilities by truces; the passage of flags of truce; the engaging in treaties of capitulation. When any conquest of territory is made the inhabitants pass under the dominion of the conqueror, and are subject to such laws as he chooses to impose upon them. There are also certain rights which war confers on the belligerents in respect to neutrals. Thus they have a right to blockade the ports or besiege the cities of their enemies, and to interdict all trade by neutrals with them. But no blockade is to be recognized unless 'the besieging force can apply its power to every point in the blockaded state.' They have a right also to insist that neutrals shall conduct themselves with good faith, and abstain from all interference in the contest by supplying their enemy with things contraband of war. And hence arises the incidental right of search of ships on the high seas for the detection of contraband goods. A neutral nation is bound to observe entire impartiality between the belligerents. Neutral nations are, strictly speaking, bound to compel their subjects to abstain from every interference in the war, as by carrying contraband goods, serving in the hostile army, furnishing supplies, etc. Subject to the exceptions above referred to, a neutral has a right to insist upon carrying on its ordinary commerce with each of the belligerents in the same manner as in times of peace.

The so-called *Declaration of London* was an attempt to codify international law so far as it related to naval warfare. It was adopted by the International Naval Conference at London in February, 1909, and although ratified by ten signatory powers did not secure the unanimous consent essential to put it into force. It dealt with disputed points of prize law, blockade, contraband, conditional contraband, the doctrine of continuous voyage, unneutral service, destruction of neutral prizes, transfer of flag, convoy, the right to visit and search, the consequences of refusal to permit visit and search, indemnity for seizure and so forth. Among articles agreed upon as being outside the contraband list were rubber, silk, flax, cotton, metallic ores and other raw materials, agricultural machinery, clocks, watches, furniture, etc. A bill incorporating the Declaration of London was passed by the British House of Commons, but the House of Lords rejected it.

Shortly after the outbreak of the European war the United States suggested to the belligerents that they adopt the provisions of the Declaration of London. Germany and Austria-Hungary agreed, provided the other nations did likewise; but Great Britain, France and Russia refused to be held by the Declaration.

Various modifications of the Declaration of London were made by British orders-in-council, some of which were disputed by the United States. Germany was also brought to task for transgressing international law by her unrestricted use of the submarine, which imperilled the lives of American citizens on the high seas. The American contention was that the U. S. Government acquiesced in the right of either belligerent to visit and search American vessels for contraband of war, but that she could not permit her vessels to be destroyed and her citizens murdered. It was Germany's insistence upon her submarine warfare, in defiance of what the United States considered international law, that finally brought this country into the war. The Court of Justice provided by the League of Nations (q. v.) was expected to codify International law. See *Peace, International.*

Interpleader (in-tėr-plēd'ėr), in law, the right or process by which a man who is called upon by two opposite parties to pay a sum or deliver over goods, and who is not sure which party is the rightful claimant, can call upon the parties to come forward as against each other, and so relieve him.

Interpolation (in-tėr-pu-lā'shun), a branch of mathematical and physical analysis, treating of the methods by which, when a series of quantities or observations succeeding each other according to some determinate law have been found, others subject to the same law may be interposed between them. Thus, the sun's right ascension being found for every Greenwich noon, its values at any other times may be filled in by interpolation; and similarly from a series of observed relations between the temperature and pressure of saturated steam, the pressure corresponding to any temperature may be found.